ADDENDUM No. 5

TO: ALL BIDDERS

FROM: CITY OF HIALEAH

RFP #: 2012/13-9500-00-033

RE: ROWTP Pipelines, Access Road and Well Pads No's 8,9,12 & 13 and Electrical Conduits & Equipments - From Sta. 200+60 to 239+65

DATE: August 6, 2013

The original contract documents for the entitled: **ROWTP Pipelines, Access Road and Well Pads No's 8,9,12 & 13 and Electrical Conduits & Equipments - From Sta. 200+60 to 239+65** need to be amended as noted in this Addendum No. 5.

This Addendum No. 5 consists of 2 typed page, 0 attachment, and 1 addendum receipt form (ARF). All other items and conditions of the original Contract Documents shall remain unchanged. This Addendum shall become a part of the Contract Documents.

Approved for issue: ______________________ Date: August 6, 2013
Carlos F. Lopez – Acting Purchasing Director

ACKNOWLEDGMENT

Receipt of this Addendum No. 5 shall be acknowledged in the space provided on the ADDENDUM RECEIPT form – ARF (Copy attached) now a part of the Contract Documents to be faxed immediately to the City of Hialeah Purchasing Division (305) 883-5871 and submitted with sealed bids.

QUSTIONS AND ANSWERS:

Questions – Reland Company Inc.

Q1. Provide specs on the proposed fill below existing grade ?
A1. Please refer to the geotechnical report prepared by Geosol, Inc. Dated May 23, 2012, see attached.

Q2. Provide specs on the proposed fill above existing grade ?
A2. Please refer to the geotechnical report prepared by Geosol, Inc. Dated May 23, 2012, see attached.

Q3. Provide specs on the proposed 8 » gravel bed ?
A3. Please see attached sketch showing a revised cross section and detail "A".

Q4. Provide specs on the proposed grass ?
A4. Please see attached specifications.

Q5. Should "Landscaping – Simpson Stopper" be quoted in EA in lieu of LF ?
A5. No.

Q6. Provide specs on the required height of the Simpson Stopper ?
A6. Please refer to sheet C-21 : 24 " HT.

Questions – Builders Choice Restoration LLC.

Q1. Please provide/add 16-12" 45 degree bends DR9 which were missing in the bid form?

A1. See attached for revised bid form.

END OF ADDENUM No. 5

CITY OF HIALEAH

ROWTP Pipelines, Access Road and Well Pads No's 8,9,12 & 13 and
Electrical Conduits & Equipments - From Sta. 200+60 to 239+65
2012/13-9500-00-033

ADDENDUM No. 5

CONTRACTOR'S NAME ______________________________

ADDRESS ______________________________

PHONE NO. ______________________________

CONTACT NAME ____________________ SIGNATURE ____________________

THE BIDDER ACKNOWLEDGES RECEIPT OF THE FOLLOWING ADDENDUM BY SIGNING AND DATING BELOW:
(Copy of this form must be faxed immediately to the City of Hialeah at (305) 883-5871).

ADDENDUM	SIGNATURE	DATE
5		

SECTION 02900

LANDSCAPING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. Work included in this Section includes furnishing and planting grass, quality specified, fertilizing, watering, maintaining plants, guarantee and obtaining all permits from municipalities having jurisdiction over this work.

B. Sodding shall be sound, healthy and vigorous, with well-developed root systems free of disease and insects, pests, eggs or larvae. No sodding will be accepted unless healthy and showing satisfactory foliage conditions.

1.02 Solid sod and grass submittal to be submitted to the City for approval prior to installation.

PART 2 - PRODUCTS

2.01 GRASSING, SOLID SOD AND SEED:

A. General:

1) Solid sod shall be planted in the unpaved areas abutting the structures and extending to the limits shown on the Plans.

2) Grass seeding: All other unpaved areas shall be planted with grass seed and mulched.

3) When solid sod or grass seed is to be placed adjacent to or in close proximity to existing sod or grass, the Contractor is to use similar sod or grass and obtain approval from the City prior to installation. In public areas and right-of-ways the Contractor is also required to comply with Governmental Agency requirements and provide the Department with written approval of said agency prior to installation of grass and sod.

B. Materials:

1) Solid Sod:

(a) Solid sod shall be certified bitter blue St. Augustine Floratam. The sod shall be firm touch texture having a compact growth of grass with good root development. It shall contain no weeds or other objectionable vegetation.

(b) The soil embedded in the sod shall be good clean earth, free from stones and other debris. The sod shall be free from fungus, vermin and other diseases. The sod and soil shall be approximately 2" thick.

(c) Before being cut and lifted, the sod shall have been mowed at least three times with a lawn mower, with the final mowing not more than seven days before the sod is cut. The sod shall be cut into uniform dimensions approximately 12" X 24". Abutting joints shall be free of open spaces with a tamped or rolled surface so that there are no joint openings.

2) Topsoil: Soil utilized for planting grasses shall be a mixture of pulverized 50% rock free siliceous sand and 50% clean mulch from an approved source. All ingredients shall be free of sticks, roots, rocks, lumps or other impurities or debris. All soil shall be delivered in a loose friable condition. Topsoil may be "unsuitable top soil" removed during the course of other work hereunder, if approved by the City. Topsoil shall be free of undesirable plants and seeds. Any such plants sprouting from areas of recent topsoil application shall be presumed to have originated in the topsoil and shall be eradicated from the area by the Contractor at his expense. Means of eradication shall be submitted to the Engineer of Record for approval.

C. Planting of Grassing:

1) Solid Sod: Unless otherwise directed by the Engineer, four inches of topsoil shall be placed. The ground area shall be saturated with water. Sod shall be placed on the graded and watered ground firmly butted on all sides by sod without leaving holes, slots, or depressions. Sod shall be top dressed with soil (herein before specified) where required to bring all fill to voids and provide a uniform grass matt if approved by the City. Soil shall firmly abut all structures to which it surrounds or contacts. Immediately after the grassing process, the entire grassed or mulched area shall be rolled thoroughly with a cultipacker traffic approved roller, or other 1,000 pound roller. At least two trips over the entire area will be required.

2) Grass Seeding: As above, place four inches of topsoil and saturate with water. Thereafter seed and mulch

D. Fertilizing Grassing:

1) Commercial fertilizers shall comply with all Federal, State and County fertilizer laws.

2) The numeral designations for fertilizer indicate the minimum percentage (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water soluble potash, contained in the fertilizer.

3) Designations may be approved specifically for a particular project and if liquid fertilizer other than that of chemical designation 8-8-8 is used, the total nitrogen content shall not exceed 12 percent.

4) At the Contractor's option liquid or dry fertilizer may be used. All grass shall be fertilized and watered in during the planting operation using the application rate and method directed by the manufacturer of the fertilizer used.

E. Guarantee and Maintenance of Grassing:

1) Guarantee:

(a) The Contractor shall guarantee all grasses for a period of six months from the date of acceptance of the completed overall project from the Contractor.

(b) The Contractor shall guarantee the grasses shall be alive, free of disease and have a healthy appearance at the end of the guarantee period.

(c) During the guarantee period, the Contractor shall replace any grass which is diseased, dead or visually unsightly within 3 days when requested in writing.

2) Maintenance:

(a) The Contractor shall maintain all grass guaranteed above for the period of the guarantee. Such maintenance shall include filling, leveling, and re-pairing eroded areas, replanting areas where the establishment of the grass does not develop satisfactorily, and watering as required. In no case shall such maintenance be less than 3 weeks for watering and 6 weeks for remaining maintenance care.

(b) The maintenance of the grass shall include, regular mowing, one application of approved dry or liquid fertilizer to the grasses guaranteed above. The fertilizer shall be applied and watered in as directed by the manufacturer. The time of fertilizing shall be approved.

(c) The Contractor shall be required under the maintenance of the guaranteed grasses to safeguard and take all possible precautions against damage from the elements and other possible damage. The Contractor shall be required to clean up the effected landscape area during the maintenance period due to any such event. The Contractor shall not be responsible to replace grasses properly protected under this item of the specifications, damaged by the events beyond his control.

2.02 PLANTS: (If required by relocation and if shown on the drawings)

A. Grade Standards and Quality:

1) Quality of all plants shall be at least equal to that defined as No. 1 by the State Plant Board of Florida in Grades and Standards for Nursery Plants, Part I, 1963 Revised Edition, and Part II, Palms and Trees.

2) All plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall have healthy, well developed root systems and shall be free of disease and insect pests, eggs or larvae.

3) No plants will be accepted unless they are healthy and show satisfactory foliage conditions.

4) All plants shall conform to the measurements specified or indicated on the

Drawings except that up to 10 percent of undersized plants in any one variety or grade may be used provided there are sufficient oversized plants to make the average equal to or above specified grade. Plants larger than specified may be used if approved by the Engineer of Record, but use of such plants shall not increase the Contract price. The spread of roots or ball of earth for larger plants shall be increased in proportion to the size of the plant.

B. Plant Designation: With reference to method of cultivation, root system status, etc., plants for landscaping shall be classified under the following designations:

1) Balled and Burlapped:

(a) Plants so classified shall be dug with firm natural root balls of earth, of sufficient diameter and depth to include most of the fibrous roots. The root ball of these plants shall be properly wrapped with burlap sack material and remain protected and moist until they are planted. Plants whose burlapped balls have cracked or become sagging, or plants showing scars from rope and cable marks or other improper handling are not acceptable. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, wet moss, or other acceptable material. The plants shall be set with the burlap cover intact and with the burlap showing, until inspection. At final inspection, the burlap may be cut away to ground level and completely covered with soil.

(b) It is required that, balled and burlapped materials, 1½ inches or more in caliper, shall be root-pruned at least 45 days before being dug and such fact shall be certified on accompanying invoices. Where, in the opinion of the Engineer of Record following his inspection of the grower's stock, adequate root pruning is being obtained by the grower's general cultivating practices, he may consider such fact as meeting this requirement.

2) Wire Balled and Burlapped:

(a) Plants grown in soil of a loose texture which does not readily adhere to the root system shall have sound hog wire placed around the burlapped ball before the plant is removed from the excavation. The wire shall be looped and tensioned until the burlapped ball is substantially packaged so as to prevent loosening of the soil around the roots during handling.

(b) Wire balled and burlapped plants shall otherwise comply with the requirements for balled and burlapped plants described in 1 above.

3) Container Grown Plants:

(a) Container grown plants shall have been grown in a container large enough and for sufficient time for the root system to have developed well enough to hold its soil together firm and whole. No plants shall be loose in the container. Plants which have become pot bound or for which the top system is too large for the size of the container, will not be acceptable.

(b) All containers with vertical sides shall be cut and opened fully, in a manner such as will not damage the root system. Container grown plants shall not be removed from the container until immediately before planting, when all due care shall be taken to prevent damage to the root system.

C. Transportation and Inspection:

1) Plant transportation shall comply with all Federal and State regulations therefor and, upon delivery at the site, all plants shall be inspected for conformity to specifications and for handling damage. Rejected plants shall be removed immediately from the site by the Contractor.

2) Immediately following the delivery and inspection at the job, all plants with exposed roots shall be heeled-in moist soil or peat moss. All plants heeled-in shall be properly maintained by the Contractor until planted.

3) The balls of balled and burlap plants, must, if not immediately planted after delivery and inspection, be adequately protected by covering until removed for planting, in a manner appropriate to prevailing conditions and in accordance with accepted horticultural practices. The Contractor shall, in loading, unloading, or handling of plants, exercise utmost care to prevent injuries to the branches or roots of the plants. The solidity of the ball of balled and burlapped plants shall be carefully preserved. Handling of the plant by parts other than the ball shall be cause for properly handled during the distribution of planting beds.

D. Planting Materials:

1) Planting Soil: Planting soil shall be a pulverized mixture of 50% rock free siliceous sand and 50% clean mulch from an approved source. All ingredients shall be free of sticks, roots, rocks, lumps, or other impurities or debris. All soil shall be delivered in a loose friable condition.

2) Fertilizer:

(a) Fertilizer shall be as specified in subsection 2.01-D, herein.
(b) Fertilizer shall be selected and used as recommended by the manufacturer for each particular plant.

3) Mulch: Mulch shall be ground bark, bark peelings, peat, hay or straw. Cypress mulch shall not be used because its harvest degrades cypress wetlands.

4) Anti-Desiccant: Anti-desiccant shall be "Wilt Pruf", "Plantguard", or equal, delivered in the manufacturer's containers and used in accordance with the manufacturer's instructions.

5) Water:

(a) Water for the irrigation of the new plantings during the progress of construction shall be provided by the Contractor in accordance with the provisions previously specified.

(b) The Contractor shall furnish adequate watering equipment and shall continue watering to properly establish the new plantings throughout the maintenance period.

6) Wire: Wire for the bracing and guying shall be pliable No. 12 or No. 14 gauge galvanized soft steel wire.

7) Stakes and Ties: Stakes and ties shall be provided in accordance with the requirements of PART 3 EXECUTION, below.

PART 3 - EXECUTION

3.01 EXCAVATION OF PLANT HOLES:

A. Plant hole excavations shall be roughly cylindrical in shape, with the sides approximately vertical. Plants shall be centered in the hole, with the trunk location as shown in the Plans.

B. Bottoms of the holes shall be loosened at least 6-inches deeper than the required depth of excavation.

C. Holes for balled and burlapped and wire balled and burlapped plants shall be large enough to allow at least 8-inches of backfill around the earth ball. For root balls over 18-inches in diameter, this dimension shall be increased to 12-inches.

D. Where excess material has been excavated from the plant hole, the excavated material shall be disposed of as and where directed by the Engineer of Record.

E. PREPARATION OF GROUND

1) Four inches minimum thickness of topsoil shall be placed over the areas off the right of way on which the sod is to be placed.

F. APPLICATION OF FERTILIZER

1) Before applying fertilizer, the soil pH shall be brought to a minimum range of 6.0 - 7.0.

2) The fertilizer shall be spread uniformly over the area to be sodded at the rate of 500 pounds per acre, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4-inches.

3) On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2-inches.

G. PLACING SOD

1) The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools. Sod areas abutting concrete, asphalt or other applicable surfaces shall have the soil depressed at edges of the pavements so that the cut grass does not protrude over 2-inches above the adjacent property.

2) Where sodding is used in drainage ditches, the setting of the pieces shall be staggered so as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6-inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.

3) On steep slopes, the Contractor shall, if so directed by the City, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth, at suitable intervals.

4) Sod which has been cut for more than 72 hours shall not be used unless specifically authorized by the City after his inspection thereof. Sod which is not planted within 24 hours after cutting shall be stacked in an approved manner and maintained and properly moistened. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.

5) Sodding shall not be performed when weather and soil conditions are, in the City's opinion, unsuitable for proper results.

H. WATERING

1) The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the City, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2 weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60 days (or until final acceptance whichever is latest).

3.02 UNDERGROUND OBSTRUCTIONS:

A. In the event that rock, underground construction work, utility lines or obstructions out of the ordinary are encountered in any plant hole excavation, alternative locations will be selected by the City.

B. Where locations cannot be changed and the obstructions may be removed, the obstructions shall be removed to a depth of not less than 3-feet below grade and not less than 6-inches below bottom of balls or roots when plant is properly set at the required grade.

3.03 SETTING OF PLANTS:

A. When lowered into the hole, the plant shall rest on a prepared hole bottom such that the roots are level with, or slightly above, the level of their previous growth and so oriented such as to present the best appearance. The Contractor, when setting plants in holes, shall make allowances for any anticipated settling of the plants.

B. The backfill shall be made with planting mixture as specified hereinbefore and shall be firmly rodded and watered-in, so that no air pockets remain. The quantity of water applied immediately upon planting shall be sufficient to thoroughly moisten all the backfilled earth. Plants shall be kept in a moistened condition for the duration of the Contract.

3.04 MULCHING:

Within one week after the planting, mulch material, approved by the City, shall be uniformly applied to a minimum thickness of 2-inches, over the entire area of the backfilled hole or bed. The mulch shall be maintained continuously in place until the time of final inspection. Mulch is not required if other ground surface covers, such as rooted cuttings are called in the Plans.

3.05 INSPECTION:

On completion of the work, the Engineer of Record will inspect all planting work. The Contractor shall repair or replace all defective work, whichever is unsatisfactory to the City or the Department. Preliminary acceptance of all plant materials will be given only after the materials are planted and after meeting all requirements prescribed herein.

3.06 MAINTENANCE:

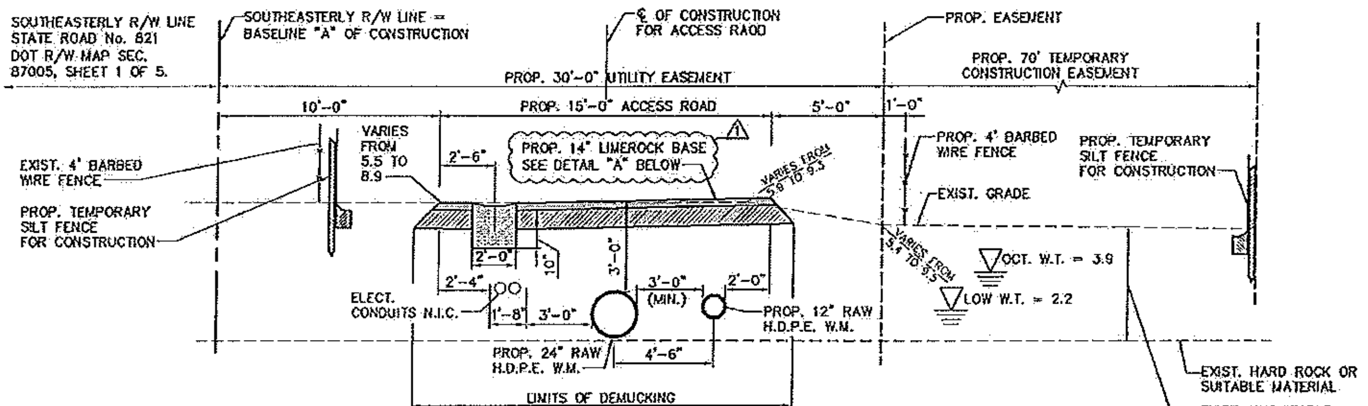
A. Maintenance shall begin immediately after each plant is planted and shall continue until all work under this Contract has been completed and final acceptance is obtained from the Department, however, the minimum period of this maintenance shall not be less than 60 days even if it extends beyond final acceptance of contract. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected. Settled plants shall be reset to proper grade position, planting saucer restored and dead material removed. Guys shall be tightened and repaired.

B. Defective work shall be corrected as soon as possible after it becomes apparent. Upon completion of planting, the Contractor shall remove from the site excess soil and debris, and repair any damage to structures, etc., resulting from planting operations.

3.07 GUARANTEE:

The Contractor shall guarantee all planting work for a period of six months after the date of final acceptance. During the guarantee period, the Contractor shall replace at no cost to the Department any plant that dies or is not established within the guarantee period. Any plants missing or defective shall be furnished or replaced in a manner satisfactory to the Department.

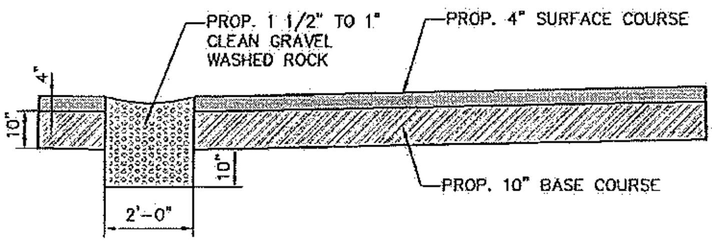
END OF SECTION



TYPICAL SECTION OF ACCESS ROAD

SCALE: 1/8"=1'

FROM STATION 200+60 TO STATION 204+95.55



NEW CONSTRUCTION FROM STATION 200+60 TO STATION 239+65

14" LIMEROCK BASE (4" SURFACE COURSE & 10" BASE COURSE)
PER FDOT SPEC SECTION 200 EXCEPTION:
FOLLOW TABLE ON THIS PAGE FOR AGGREGATE
GRADATION & SIEVE ANALYSIS ON 4" SURFACE COURSE

U.S. SIEVE	A (SURFACE)	B (BASE)	C (SUBBASE)
3"	--	--	100
2"	--	100	--
1.5"	--	85-100	70-100
1"	100	--	--
3/4"	85-100	--	--
1/4"	50-75	30-50	30-55
#40	15-35	5-20	5-25
#200	8-15	0-5	0-8

PERCENT PASSING BY WEIGHT OF GRAVEL MATERIAL

DETAIL "A"

SCALE: 1/4"=1'

CITY OF HIALEAH

HIALEAH - ROWTP PIPELINES

REV.	DATE	BY:	DESCRIPTION
1	07/30/13	J.C.F.	ADDENDUM #1

DESIGNED BY: J.C.F.
DRAWN BY: Y.P.
CHECKED BY: I.S.
DATE: 04/16/2012

SEAL:
IGNACIO SERRALTA
REGISTERED ENGINEER No. 45693
STATE OF FLORIDA

SRS ENGINEERING, INC.
CONSULTING ENGINEERS
5601 Southwest 74th Court, Suite 201
Miami, Florida 33155-4493
TEL. 305-662-6300, FAX 305-662-0050
WWW.SRS-CORP.COM
EB-00007317

SCALE: AS SHOWN
PROJECT NO.: 1102
DWG. NO.:
SHEET: C-4

CITY OF HIALEAH REVERSE OSMOSIS WATER TREATMENT PLANT DESIGN OF RAW WATER TRANSMISSION MAIN, WELL MAINTENANCE PIPELINE AND WELL SITE DEVELOPMENT GRAHAM PROPERTY NORTHEAST CORNER OF NW 107TH AVE. AND NW 170TH ST. CITY OF HIALEAH, FLORIDA

GEOTECHNICAL REPORT FOR WELL Nos. 8, 9, 12 AND 13, ASSOCIATED PIPELINES AND CANAL CROSSING

PREPARED FOR: PARSONS WATER & INFRASTRUCTURE, INC.

PREPARED BY: GEOSOL, INC.

MAY 23, 2012

GEOSOL, Inc.

May 23, 2012

Parsons Water & Infrastructure, Inc.
Fountain Square II, Suite 120
4925 Independence Parkway
Tampa, Florida 33634-7540

Attention: Mr. David Irvine, P.E.
Project Manager

Re: **Geotechnical Report for Well Nos. 8, 9, 12 and 13, Associated Pipelines and Canal Crossing**
City of Hialeah Reverse Osmosis Water Treatment Plant
"Design of Raw Water Transmission Main, Well Maintenance Pipeline and Well Site Development"
Graham Property
Vicinity of NW 107th Avenue and NW 170th Street
GEOSOL Project No. 211130

Dear Mr. Irvine:

Geosol, Inc. (GEOSOL) is herein presenting this geotechnical report containing the results of our field exploration and laboratory testing programs as well as our geotechnical engineering evaluations and recommendations specifically for the proposed Well Nos. 8, 9, 12 and 13, associated pipeline system and canal crossing. Authorization for our services was provided by means of subcontract amendment #3 dated March 24, 2011.

This report presents the results of our field exploration and laboratory testing programs for the proposed wells, associated pipeline system, and canal crossing along with our geotechnical evaluations and recommendations. A summary of our findings can be found in the Executive Summary section of the report.

GEOSOL appreciates the opportunity to work on this interesting project. If you have any question or need additional information, please do not hesitate to call our office.

Sincerely,
GEOSOL, INC.

ORACIO RICCOBONO LICENSE No. 49324 STATE OF FLORIDA PROFESSIONAL ENGINEER

Oracio Riccobono, P.E.
Senior Geotechnical Engineer/President
Florida License No. 49324

Reinaldo Villa, P.E.
Project Geotechnical Engineer
Florida License No. 72242

OR/rv

cc: Addressee (5)
File (1)

GEOSOL, Inc.

5795-A NW 151st Street
Miami Lakes, FL 33014
Phone (305) 828-4367; Fax (305) 828-4235
E-mail: geosolusa@bellsouth.net

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APPENDICIES

APPENDIX "A"

APPENDIX "B"

1.0 EXECUTIVE SUMMARY

As we understand it, the project will include the design and construction of raw water transmission main, well maintenance pipeline system and well site development consisting of four (4) well sites (No. 8, 9, 12, and 13) with plan dimensions of 50 feet wide by 50 feet long. The proposed pipelines have variable diameters ranging from about 12 to 30 inches. Additionally, a temporary bailey bridge will be constructed to serve as a canal crossing in the vicinity of NW 107th Avenue and NW 170th Street. This phase of the project was limited to the performance of a subsurface exploration program and foundation evaluation for the proposed Well Nos. 8, 9, 12 and 13, the associated pipeline system and canal crossing in the Graham Property located at the northeast corner of the intersection of NW 107th Avenue and NW 170th Street in the City of Hialeah, Florida. A Site Vicinity Map is presented on Sheet 1 of Appendix "A". The site stratigraphy and our recommendations for foundation design and related construction are summarized below.

- The field exploration program consisted of performing two (2) Standard Penetration Test (SPT) borings and eight (8) hand auger borings for wells and pipelines and two (2) SPT borings for the proposed canal crossing. The explorations performed at the site generally disclosed the site to be mantled by a layer of topsoil in the upper 2 inches, granular fill, or organic soils (OL/PT). Below and occasionally at the ground surface, a layer of granular fill materials were generally encountered which consisted of loose to dense slightly silty fine to medium-grained sand with variable percentages of limerock fragments. This layer was generally encountered to depths ranging from about 2 to 5 feet below existing grades. Below, and occasionally at the ground surface, a layer of organic silt or peat (OL/PT) was encountered to depths ranging from 2.5 to 6 feet below existing grades. Below, the natural Miami limestone formation was encountered to depths of about 8 feet below grade followed by the Fort Thompson Limestone Formation to the termination depths of the borings ranging from 15 to 35 feet below existing grades. The groundwater elevations encountered ranged from +1.8 to +1.9 (NGVD, 1929), with an average elevation of about +1.9 feet (NGVD, 1929). The variation in groundwater levels can be attributed to rainfall activity during the drilling activities and due to the fact that groundwater levels did not have sufficient time to stabilize after drilling.

- We have provided recommendations for supporting the proposed well buildings on a shallow foundation system. Furthermore, we have provided recommendations for supporting the well buildings on a deep foundation system if required due to the magnitude of uplift (buoyant) forces depending on the invert elevation of the well building. Specifically, we have provided foundation recommendations for shallow foundations consisting of a reinforced concrete slab (i.e. mat foundation) and for deep foundations consisting of Auger Cast-In-Place (ACIP) piles. A shallow foundation system is feasible given the subsurface conditions encountered during our study. It should be noted that organic silt/peat (OL/PT) material was encountered in the upper 2.5 to 6 feet of the site and this material shall be completely removed and replaced with select granular fill materials if a shallow foundation system is selected. However, uplift (buoyant) forces may be a design issue depending on the invert elevation of the proposed well buildings and for this reason, we provided ACIP pile recommendations to resist uplift forces.

- The foundations for the proposed well buildings may bear on the surface of acceptable compacted structural fill materials, on the surface of existing granular fill materials, or on the surface of the natural Miami Limestone Formation. If shallow foundations are selected, the unsuitable organic silt/peat (OL/PT) materials encountered in the test boring locations shall be completely removed and replaced with select fill materials. We recommend that the footings bearing on the surface of compacted structural fill, existing granular fill, or on the surface of the natural Miami Limestone Formation may be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf) after site preparation has been properly implemented. We have estimated the total vertical settlement of the mat foundation to be less than one (1) inch based on the maximum allowable bearing capacity of 3,000 psf and the anticipated footprint of 50 feet wide by 50 feet in length.

- We recommend that a deep foundation system be used (if needed) to resist uplift loads. In our opinion, the most economical deep foundation system involves the installation of Auger Cast-In-Place (ACIP) piles with relatively small embedment (rock socket) of 5 feet into the lower Fort Thompson Limestone Formation. For design, we assumed that the top of the bearing layer that is part of the natural Fort Thompson Limestone Formation starts at an elevation of -20 feet (NGVD, 1929). We anticipate that a properly reinforced 12-inch diameter ACIP pile could sustain an allowable compression and tension capacities of 40 and 20 tons, respectively. A 14-inch diameter ACIP pile can achieve allowable compression and tension capacities of 50 and 25 tons, respectively. A 16-inch diameter ACIP can withstand about 55 and 25 tons of allowable compression and tension capacities, respectively. Additionally, an 18-inch diameter ACIP pile can achieve allowable compression and tension capacities of 60 and 30 tons, respectively. The pile capacities depend on the size of pile size selected. These pile capacities apply if a load testing program is completed. If it is desired to eliminate the load test program, the ACIP piles shall be designed for maximum allowable compression and tension capacities of 35 and 15 tons, respectively. Total and differential settlements as well building as lateral deflections of not more than 1, ½ -inch and ½-inch, respectively, are expected. The pile lengths will vary given the subsurface conditions encountered at the site, the pile size selected by The Designer and the cut-off elevation.

- The proposed pipelines may bear on the surface of acceptable compacted structural fill materials, on the surface of the existing granular fill materials, or on the surface of the natural limestone formation. We recommend using an allowable bearing capacity of 3,000 pounds per square foot (psf) when resting on the surface of granular soils or 5,000 psf when resting on the surface of the natural limestone formations after site preparation has been properly implemented.

- The proposed footings for the temporary bailey bridge may bear on the surface of acceptable compacted structural fill materials or on the surface of the natural limestone formation. We recommend using an allowable bearing capacity of 3,000 pounds per square foot (psf) when resting on the surface of granular soils or 5,000 psf when resting on the surface of the natural limestone formations after site preparation has been properly implemented.

- The owner/designer should not rely solely upon the executive summary and must read and evaluate the entire contents of this report prior to utilizing our engineering recommendations in the preparation of design and construction documents.

2.0 INTRODUCTION

2.1 Authorization

Authorization for our services was provided by means of subcontract contract amendment #3 dated March 24, 2011 between GEOSOL and Parsons Water & Infrastructure, Inc. (PARSONS).

2.2 Purpose

The purpose of the geotechnical study was to evaluate the subsurface and groundwater conditions at the site of the proposed well buildings, associated pipeline system and canal crossing, to recommend a type and depth of foundation system suitable for the proposed wells and canal crossing, and to provide excavation recommendations for the installation for the proposed pipelines.

2.3 Scope

The scope of this study included subsurface exploration, field testing, engineering analysis and evaluation of the foundation materials. The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site.

2.4 General

The general analysis of the foundation conditions reported herein is considered sufficient to form a reasonable basis for foundation design. The recommendations submitted for the proposed Well Nos. 8, 9, 12 and 13; pipeline distribution system; and the canal crossing construction are based on the available subsurface information and the design details furnished.

If there are any revisions to the plans for the proposed construction, or if deviations from the subsurface conditions noted in this report are encountered during construction, GEOSOL should be retained to determine if changes in the foundation recommendations are required. If GEOSOL is not retained for these functions, GEOSOL will not be responsible for the impact of those conditions on the performance of the structures.

3.0 PROJECT DESCRIPTION AND INFORMATION

3.1 General

As we understand it, the City of Hialeah is planning to construct a Reverse Osmosis Water Treatment Plant (ROWTP) located in the vicinity of NW 170th Street and NW 102nd Avenue in the City of Hialeah, Florida. Based on the scope of services provided by PARSONS on January 26, 2011, the project consists of installing 12 to 30-inch diameter mains that will carry raw water from a system of 13 proposed well sites to and from the proposed ROWTP. Specifically well Nos. 8, 9, 12, and 13 as well as pipelines with diameter ranging from 12 to 30 inches will be constructed on the west section of the Graham Property, which is located on the northeast corner of the intersection of NW 107th Avenue and NW 170th Street. We understand that a canal crossing is under consideration at the intersection of NW 170th Street and NW 107th Avenue. The canal runs along the north side of NW 170th Street. As we understand it, the canal crossing will consist of a temporary bailey bridge to be supported by spread footings.

As requested by PARSONS, the geotechnical services for this phase included the performance of Standard Penetration Test (SPT) borings for use in site characterization and foundation evaluations for the proposed Well Nos. 8, 9, 12 and 13; associated pipelines; and canal crossing.

3.2 Loading Information

For this phase of the project, design loading and detailed information for the proposed wells or canal crossing is not available.

4.0 DESCRIPTION OF SITE

4.1 Site Location

The proposed wells and associated pipelines are located in the Graham Property, which is on the northeast corner of the intersection of NW 107th Avenue and NW 170th Street in the City of Hialeah, Florida. A canal crossing is being considered at the intersection of NW 170th Street and NW 107th Avenue, where a canal runs along the north side of NW 170th Street. We have appended a Vicinity Map which identifies the location of the study area. This map is presented in Sheet 1 of Appendix "A".

4.2 Site Conditions

A representative of GEOSOL observed the site conditions on May 2, 2012. There is a canal that runs along the north side of NW 170th Street. Specifically, the proposed wells and pipelines will be located in an easement on the western part of the Graham Property. There was standing water observed during out site visit. The site also has dense vegetation and grass, and the easement dedicated to the proposed pipelines is covered by soft, very compressible organic soils (muck), which did not allow us to access the majority of the site with our geotechnical drilling equipment.

5.0 FIELD EXPLORATION

5.1 General

The field exploration to evaluate the engineering characteristics of the foundation materials for the proposed construction included a reconnaissance of the project site, drilling of test borings, performing Standard Penetration Tests (SPT), recovering split-spoon samples and hand auger borings. Water level measurements were recorded in each borehole location. The test boring locations were marked in the field by representatives of GEOSOL utilizing plans depicting the locations of the proposed wells, pipelines and canal crossing; standard taping procedures; and existing landmarks. The "as-drilled" latitude and longitude coordinates were obtained by utilizing a hand-held Global Positioning System (GPS) device and converted to northing and easting coordinates utilizing the software "Corpscon" developed by the United States Arms Corps of Engineers. The ground surface elevations at each test location were estimated from a topographic survey provided by PARSONS. All test location coordinates and ground surface elevations should be considered approximate. The subsurface exploration program was performed on May 2, 2012. The procedures used for drilling, sampling, and conducting field tests and measurements are discussed in the Drilling and the Sampling Procedures Section included in Appendix "A". Table 1 and Sheets 2 through 7 of Appendix "A" of this report present the "as-drilled" test boring locations.

It should be noted that SRS Engineering, Inc. requested the performance of two (2) SPT borings for the proposed canal crossing and nine (9) SPT borings for wells and pipelines. However, the majority of the site was inaccessible to truck and All-Terrain Vehicle (ATV)-mounted drilling equipment due to the wet ground and soft, highly compressible muck that was at the ground surface at the time of our study. As a result, field exploration program consisted of only performing a total of four (4) Standard Penetration Test (SPT) borings on the southern area of the project site that was accessible to truck-mounted drilling equipment, and eight (8) hand auger borings in the Graham Property in areas of the proposed wells and pipes that were inaccessible to truck or ATV-mounted drilling equipment. Specifically, a total of two (2) SPT borings (SB-1 and SB-2) were performed to depths ranging from 15 to 35 feet below existing grades for the proposed wells and pipelines. Also, a total of two (2) SPT borings (BB-1 and BB-2) were performed to depths of 15 feet below existing grades for the proposed canal crossing. Additionally, a total of eight (8) hand auger borings (HA-2 through HA-9) were performed in order to determine the extent of organic soils at the surface of the site. The results of the test borings are presented in the form of Report of Core Boring profiles and have been included in Appendix "A" of this report. Also, Table 2 of this report presents a summary of the hand auger borings.

6.0 LABORATORY TESTING PROGRAM

6.1 General

Representative samples collected from the test borings were visually reviewed in the laboratory by a Geotechnical Engineer to confirm the field classifications. The samples obtained from SPT borings and hand auger borings performed for the proposed wells, associated pipelines and canal crossing were then classified using the Unified Soil Classification System (USCS) in general accordance with the American Society of Testing and Materials (ASTM) test designation D-2488, titled "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)" and ASTM D-2487 titled "Standard Test Method for Classification of Soils for Engineering Purposes". The visual classifications were confirmed by performing laboratory classification testing which consisted of moisture content and organic content determination. Table 3 in Appendix "B" presents a summary of the laboratory test results. Additionally, corrosion series testing that was performed on water samples recovered from the field investigation performed in other areas of the project were included in this report for information purposes. Table 4 in Appendix "B" presents a summary of the corrosion series testing performed for this project.

6.2 Moisture Content

The laboratory moisture content test consists of the determination of the percentage of moisture contents in selected samples in general accordance with FDOT Test Designation FM1-T265 (ASTM Test Designation D-2216, titled "Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures"). Briefly, the moisture content is determined by weighing a sample of the selected material and then drying it in a warm oven. Care is taken to use a gentle heat so as not to destroy any organics. The sample is removed from the oven and re-weighed. The difference of the two weights is the amount of moisture removed from the sample. The weight of the moisture divided by the weight of the dry soil sample is the percentage by weight of moisture in the sample. The test results are summarized in Table No. 3 in Appendix "B".

6.3 Organic Content

Organic content test consists of the determination of the percentage of organic content in selected samples in general accordance with FDOT Test Designation FM1-T267 (ASTM Test Designation D-2974, titled "Moisture, Ash, and Organic Matter of Peat and Other Organic Soils"). Briefly, the organic content is determined by weighing a sample of the selected material and then burning off the organic material in a hot oven. The sample is removed from the oven and re-weighed. The difference of the two weights is the amount of organic material removed from the sample. The weight of the organic material divided by the weight of the dry soil sample is the percentage by weight of organic material in the sample. The organic content test results are summarized in Table No. 3 in Appendix "B".

6.4 Environmental Classification Testing

We have included corrosion series testing from water samples obtained from another phase of the project. Environmental corrosion tests include parameters such as pH, resistivity, sulfates content, chlorides content and redox potential. The environmental corrosion tests were conducted in general accordance with the ASTM D-1498 and FDOT Test Designations FM5-550, 5-551, 5-552, and 5-553. Based on the laboratory test results and the FDOT's *Structures Design Guidelines*, Section 1.3, we recommend a moderately aggressive environment for substructure and slightly aggressive for the superstructure. The test results obtained are tabulated in Table 4 in Appendix "B" of this report.

7.0 SUBSURFACE CONDITIONS

7.1 General

Subsurface materials encountered in the borings have been visually examined and classified and are described on the Report of Core Boring profiles and Table 2 presented in Appendix "A" The results of the Standard Penetration Tests and water level observations are also presented on the Report of Core Boring profiles in Appendix "A". The results of the hand auger borings are presented in Table 2 of Appendix "A". The stratification of the profile components as shown on the Report of Core Boring profiles represent the subsurface conditions at the actual boring locations. Variations may occur within a short distance from the borings. The subsurface stratification lines presented on the boring logs represent the approximate boundary between the types of materials encountered, but the transition may be gradual, or not clearly defined. It is to be noted that, whereas the test borings are drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits.

7.2 Regional Geology

The Miami area of southern Florida is underlain by an alternating sequence of cemented and uncemented Pleistocene sedimentary deposits (Pleistocene Epoch, deposited 10,000 to 2 million years before the present). A near surface Miami Limestone is underlain by a wide variety of loose to dense quartz sands and coarse to fine-grained limestones and sandstones (Fort Thompson Formation). However, in many portions of Miami-Dade, surface sand deposits of the Pamlico Formation and man-made fill materials are encountered. The Pamlico Formation is composed of unfossiliferous, unconsolidated quartz fine sand. The man-made fill deposit generally consists of granular fill material. The thickness of these deposits is in the order of three (3) to five (5) feet. Generally, the Pamlico formation overlies the Miami Limestone Formation. In the west part of the county, portions of the Everglades interfingers with the Pamlico Formation sands. The Everglades soils consist of peat, organic silt and calcareous silt marl. Generally, the Everglades soils have a thickness in the order of three (3) to five (5) feet and overlie the Miami Limestone Formation.

The limestones found in the Miami area are much softer than the hard rock formations found elsewhere in the U.S. Although the limestone in Miami can be very porous and have a sponge-like open interconnected network of vugs and small voids, large cavities prone to sinkhole activity are not generally found in the Miami area because the rock formations of South Florida are relatively young, as compared to those encountered in other parts of Florida.

The strength of the limestone as well as its deformation characteristics depends upon the degree of cementation of the formation and its alteration by solutioning and weathering subsequent to deposition. One of the most important characteristics of the limestone encountered in the project area is the degree of erosion. Past surface solutioning of the limestone has resulted in formation called "pinnacle rock". In some cases nearly vertical cylindrical-shaped solution cavities are filled with surficial fine sands extending below the groundwater level. The subsurface conditions encountered at the site are summarized in the following section.

7.3 Subsurface Conditions

The explorations performed at the site generally disclosed the site to be mantled by a layer of topsoil in the upper 2 inches, granular fill, or organic soils (OL/PT). Below and occasionally at the ground surface, a layer of granular fill materials were generally encountered which consisted of loose to dense slightly silty fine to medium-grained sand with variable percentages of limerock fragments. This layer was generally encountered to depths ranging from about 2 to 5 feet below existing grades. Below, and occasionally at the ground surface, a layer of organic silt or peat (OL/PT) was encountered to depths ranging from 2.5 to 6 feet below existing grades. Below, the natural Miami limestone formation was encountered to depths of about 8 feet below grade followed by the Fort Thompson Limestone Formation to the termination depths of the borings ranging from 15 to 35 feet below existing grades.

7.4 Geotechnical Design Soil/Rock Parameter Recommendations

Table "A" below presents a summary of the geotechnical design soil/rock parameters recommended for design. The recommended soil/rock parameters were derived on the basis of established empirical relationships between the SPT N-value and the internal friction angle (ϕ), empirical correlations, literature review, statistical evaluation of the field data, and our local experience. Specific details concerning the groundwater levels, subsurface materials and conditions encountered at each test location may be obtained from the Report of Core Boring profiles and Table 2 presented in Appendix "A" of this report.

TABLE "A"- SUMMARY OF GEOTECHNICAL DESIGN PARAMETERS

GENERAL MATERIAL DESCRIPTION (USCS Symbol)	UNIT WEIGHT (pcf)		FRICTION ANGLE (Degrees)	COHESION (psf)	EARTH PRESSURE COEFFICIENTS		
	TOTAL	EFFECTIVE			ACTIVE	PASSIVE	AT-REST
	γ_t	γ_{eff}	ϕ	C	Ka	Kp	Ko
Granular Fill (SP-SM)	115	48	34	0	0.28	3.54	0.44
Organic Sand (OL/PT)	90	28	23	0	0.43	2.28	0.61
Miami Limestone Formation	120	58	-	5,000	-	-	-
Ft. Thompson Limestone Formation	120	58	-	16,000	-	-	-

Note: (1) For retaining wall design, the friction between the soil and retaining wall (δ) may be assumed to be $\frac{1}{2}\phi$.

7.5 Groundwater Conditions

Groundwater levels were measured in the open boreholes during the drilling and sampling operations. The water levels measured in the test borings ranged from 2.1 to 3.9 feet below existing grades (elevation ranging from +1.8 to +1.9 feet (NGVD, 1929). The average groundwater elevation was encountered to be about +1.9 feet (NGVD, 1929). The difference in water depths is due to differences in site elevations. However, please note that groundwater levels fluctuate seasonally as a function of rainfall and the infiltration rate of the soil. It is to be noted that the test borings testing were performed during the dry season.

Therefore, at the time of the year different from the time of drilling, there is a possibility of a change in the recorded levels. Therefore, we estimate that during the peak of the wet hydroperiod, with rainfall and recharge at a maximum, groundwater levels at the site could be twelve (12) to eighteen (18) inches higher than those measured in the borings.

8.0 FOUNDATION EVALUATION FOR WELL SITES

8.1 General

Results of this study indicate that the site is generally suitable for the planned construction when viewed from a geotechnical engineering perspective. However, planning for the construction of the proposed well buildings on the subject site should carefully consider the impact of the low strength and highly compressible organic soils (OL/PT) existing at the ground surface to depths ranging from 2.5 to 6 feet below existing grades. We have provided recommendations for supporting the proposed well buildings on a shallow foundation system. Furthermore, we have provided recommendations for supporting the proposed well buildings on a deep foundation system if high uplift (buoyant) forces are expected depending on the invert elevation of the structure. Specifically, we have provided foundation recommendations for shallow foundations consisting of a reinforced concrete slab (i.e. mat foundation) and for deep foundations consisting of Auger Cast-In-Place (ACIP) piles. A shallow foundation system is feasible given the subsurface conditions encountered during our study. However, based on our previous experience with similar structures, uplift (buoyant) forces may be a design issue depending on the invert elevation of the proposed well buildings. Therefore, if it is anticipated that uplift (buoyant) forces control the design, a deep foundation system may be required.

The organic soils (OL/PT) materials encountered in our study will not offer satisfactory support to shallow foundations and/or a settlement sensitive slab-on-grade floor owing to their low strength, high compressibility, and random engineering characteristics. Compression of the organic soils (OL/PT) materials will occur as a result of primary and secondary consolidation. Primary consolidation is a volume reduction process associated with vertical compression of the soil fabric as the pore water is squeezed from the soil void space under vertical load. The process is usually complete within a time frame of about 2 to 4 months. Secondary consolidation will occur in organic soils as a result of the decay of the organic matter in the soil over time.

Assuming a maximum footing bearing pressure of 3,000 pounds per square foot (psf) to be applied for a mat foundation, we estimate that the primary settlement of the organic soils (OL/PT) materials to be in excess of about 6 to 12 inches. Furthermore, any new fill placed to raise site grades will serve to increase the magnitude of settlement due to primary consolidation compression. Additionally, we estimate over 2 to 4 inches of secondary (long-term) compression of the organic soils as the organic mater decays with time.

Safe use of a mat foundation will necessitate that the weak organic soils (OL/PT) materials be completely removed and replaced with well-compacted structural fill (soil exchange). The following section discusses the soil exchange procedure.

8.1.1 Soil Exchange

This technique involves the complete excavation and removal of organic soils (OL/PT) and backfilling of the resultant volume with clean granular soils that are placed and compacted in a controlled fashion. The plan limits of soil removal should include the structural footprint plus a 10-foot wide perimeter zone (extending beyond the building footprints). After the complete removal of the unsuitable, highly compressible organic soils (OL/PT) materials and proper implementation of our site preparation recommendations, the shallow foundations for the proposed well buildings may bear on the surface of acceptable compacted structural fill materials or on the surface of the natural sand layer. We recommend that footings bearing on acceptable compacted structural fill materials be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf). Alternatively, shallow foundations may be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf) for footings resting on the surface of the existing natural Miami limestone formation.

Following excavation of the unsuitable soils and control of groundwater seepage, the excavated area should be restored to grade with granular fill that is placed and compacted in a controlled manner. Fill required for this purpose should consist of clean sand or a mixture of sand and gravel with no particle size larger than 6 inches and not more than 12 percent passing the U.S. Standard Number 200 sieve. The fill should be placed at a moisture content within three percent of optimum in lifts that do not exceed 12 inches in un-compacted thickness. Each fill lift should be uniformly compacted to 95 percent of the ASTM D1557 modified Proctor maximum dry density.

It should be noted that provisions for sloping, shoring and bracing of deep excavations are required by OSHA and other building codes and these should be adhered to if applicable. Materials removed from the excavation should not be stockpiled immediately adjacent to the cut, inasmuch as this load may cause a sudden collapse of the sidewalls.

9.0 RECOMMENDATIONS FOR SHALLOW FOUNDATION SYSTEM FOR WELL SITES

9.1 Foundation Design

Based on the results of our subsurface exploration and foundation evaluations, the proposed well buildings may be supported on shallow foundations consisting of a reinforced concrete slab (i.e. a mat foundation) bearing on the surface of the of acceptable compacted structural fill materials, on the surface of the existing granular materials, or on the surface of the natural limestone formation encountered during our study. The foundations should be designed using a maximum allowable bearing capacity of 3,000 pounds per square foot (psf) for a mat foundation resting on the surface of acceptable compacted structural fill materials, on the surface of the existing granular materials, or on the surface of the existing natural limestone formation. For footings resting on acceptable compacted structural fill materials, the site preparation recommendation presented in this report must be properly implemented. Additional criteria regarding foundation design and construction is presented in the following sections of the report.

9.1.1 Footings Bearing on Granular Materials or Limestone Formation

The mat foundation may bear on the surface of acceptable compacted structural fill, on the surface of the existing granular fill materials, or on the surface of the natural limestone formation encountered at the site. Preparation of the site to receive the new construction should include removal of existing topsoil, grass and/or vegetation system, and unsuitable soils. We recommend that the foundation bearing on acceptable compacted structural fill, on the surface of the existing granular fill materials or on the surface of the natural limestone formation be designed using allowable bearing capacity of 3,000 psf.

The mat foundation should be suitably reinforced to make it as rigid as practical. A modulus of subgrade reaction (k) value of 250 pounds per cubic inch (pci) may be used for mat foundation design when lying on structural fill materials that have been compacted to at least 95% of the modified Proctor maximum dry density determined by ASTM D-1557. If moisture intrusion into the mat foundation is not desired, an impermeable membrane should be installed on the soil subgrade before the foundation is cast. Normally, a 6-mil thick polyethylene film is satisfactory as a subgrade moisture barrier.

Depending on the invert elevation of the proposed well buildings, uplift (buoyant) forces may control the design. If so, the mat foundation should be checked for uplift capacity assuming that only the weight of the slab will support the uplift (buoyant) forces. The factor of safety against uplift should not be less than 1.5. If uplift (buoyant) forces are high, it may be necessary to support the proposed well buildings using a deep foundation system.

9.2 Settlement Potential

The amount of settlement that a mat foundation founded on top of acceptable compacted structural fill, on the surface of the existing granular fill materials or on the surface of the natural limestone formation will experience is primarily governed by the compressibility of granular fill materials, the sizes and depths of the foundations, and the pressure imposed on the supporting materials. We have compared the data obtained from the SPT borings performed with our foundation design experience with similar structures founded on top of granular materials.

Footings designed with the criteria in Section 9.1 and constructed in the manner recommended in Section 13.0 are estimated to sustain maximum total settlements in the range of one (1) inch, which correspond to the maximum allowable bearing capacity of 3,000 psf. Differential settlement across the mat foundation is expected to be one-half of the total settlement. Distortions that occur along the foundation should not be more than 1 in 1000.

Granular fill materials which will provide support to the footings have low compressibility and any settlement due to pressure applied by the foundations is likely to occur almost immediately upon application of the loads. In this case, nearly all of the settlement of the foundations due to dead loads is expected to take place during construction. The portion of the settlement due to the live loadings of the structure will generally take place soon after the first application of this load.

10.0 RECOMMENDATIONS FOR DEEP FOUNDATION SYSTEM FOR WELL SITES

10.1 General

Given the possible high magnitudes of uplift (buoyant) forces that may be acting on the proposed well system depending on the invert elevation, a shallow foundation system may not be feasible. Therefore, it may be required to support the proposed well buildings on a deep foundation system depending on the magnitude of uplift (buoyant) forces. The Auger Cast-In-Place (ACIP) pile appears to be the most suitable and economical foundation system for the support of the proposed well buildings. At this point, we have not been provided with the preferred diameter of the ACIP piles, the design loading information, pile configuration or pile cut-off elevations. However, we have provided recommendations for typical pile diameters that range from 12 to 18 inches with a small embedment (rock socket) length of 5 feet for The Structural Engineer's considerations.

10.2 Deep Foundations - Axial Capacity of Auger Cast-In-Place Piles

If required due to uplift (buoyant) forces, we recommend that the proposed well buildings be supported on a deep foundation system which extends into the relatively stronger part of the lower Fort Thompson Formation Limestone layer, the top of which was encountered at a depth of about 23 feet below existing grade (elevation of about -17.4 feet, NGVD, 1929). In our opinion, the most economical deep foundation system to resist uplift forces at the well building sites consists of ACIP piles. We recommend that the ACIP piles penetrate a minimum of 5 feet (rock socket) into the bearing layer that is part of the lower Fort Thompson Limestone Formation.

Since the design loading information or preferred pile diameter has not been provided to us at this point, we have provided pile capacities for a rock socket of 5 feet into the lower Fort Thompson Limestone Formation and for ACIP pile diameters ranging from 12 to 18 inches. The Designer should select the appropriate pile diameter based on the anticipated loads and pile configuration that is selected. The pile lengths will vary for each structure depending on the pile size selected for the proposed well buildings. We have assumed that the top of the bearing layer in the Fort Thompson Limestone Formation starts at elevation -20 feet (NGVD, 1929) in order to bypass the slightly weathered/softer part of the rock formation and have the ACIP piles rest a firm bearing layer to avoid excessive settlements. Therefore, the expected pile tip elevations are -25 feet (NGVD, 1929) for a rock socket length of 5 feet.

The capacities were estimated by summing the product of the effective lateral stresses on the pile and the soil profile friction over the length of the piles in addition to axial capacity mobilized due to end bearing. Table "B" on the following page presents a summary of the allowable compression, uplift and lateral load capacities that the ACIP pile may develop. The Structural Engineer shall specify the required pile reinforcement to withstand the design compression, tension and lateral loads.

10.3 Deep Foundations - Lateral Load Capacity of Auger Cast-In-Place Piles

At this time we have performed lateral load capacity evaluations for ACIP piles ranging in diameters from 12 to 18 inches using a small embedment (rock socket) length of 5 feet into the bearing layer. Once the final diameter is selected and the design loading information is provided, we can re-visit these recommendations and update them if necessary.

The lateral load analyses of ACIP piles have been performed using the LPILE computer software developed by Ensoft, Inc. The analyses presented herein are based on pile stiffness (EI), estimated using 100 percent of the gross value of EI value. The modulus of elasticity for grout (E_g) was estimated as 4,030 kips per square inch (ksi) using a 28-day grout compressive strength (f'_c) of 5,000 psi. A summary of the laterally loaded pile capacity evaluations for the ACIP piles is presented on Table "B" of this report.

It is to be noted that The Structural Engineer shall design the reinforcement for the ACIP piles. Typically, ACIP reinforcement consists of full length reinforcement cages with four to six # 6 bars up to ten # 10 bars tied in a circular arrangement with ties spaced at 6 to 12 inches on center. These reinforcement cages are placed in the boreholes after grouting and centered using either # 3 rebar ties as centralizers or wheel centralizers at 10 to 15 feet spacing.

TABLE "B" – SUMMARY OF ACIP PILE CAPACITIES

Pile Dia. (in.)	Rock Socket Length (1, 2, 3) (ft.)	Minimum Top of Rock Elevation (1) (ft.; NGVD, 1929)	Pile Tip Elevation (ft.; NGVD, 1929)	Allowable Pile Capacities (Tons) (5)		
				Compression	Tension	Lateral (4)
12	5	-20	-25	40	20	2
14	5	-20	-25	50	25	3
16	5	-20	-25	55	25	4
18	5	-20	-25	60	30	4

Notes:

1) Rock socket length represents embedment into the bearing layer (i.e. Fort Thompson Limestone Formation) which was assumed to start at elevation -20 feet (NGVD, 1929).
2) Pile lengths are expected to be somewhat variable based on the selected pile diameter, loading conditions determined by The Designer and pile cut-off elevations.
3) Final rock socket and production pile lengths to be based on performance of a pile load test program.
4) Lateral deflections are estimated to be in the order of a ½ -inch, based on the allowable pile capacities.
5) The allowable pile capacities listed in the above table only apply if a load testing program is performed. If it is desirable to eliminate the load test program, the allowable compression and tension capacities of the piles should be limited to 35 and 15 tons, respectively.

10.4 Deep Foundations - Settlement and Lateral Deflections of Auger Cast-In-Place Piles

Settlement of the pile-supported structures should by small and tolerable using the recommended pile load capacities. Based on our analysis, it is estimated that the settlement of a single pile under allowable working loads will be less than about 1 inch. Differential settlements are expected to be half of the total settlement. Lateral deformations are estimated to be in the order of a ½-inch, based on the allowable pile capacities.

11.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS FOR PIPELINE DISTRIBUTION SYSTEM

11.1 General

The test borings performed for this project generally revealed suitable subsurface conditions for support of the proposed pipeline distribution system. However, it should be noted that unsuitable organic soils were encountered to depths ranging from about 2.5 to 6 feet below existing grades. Planning for the construction of the proposed pipeline system at the subject site should carefully consider the impact of the low strength and compressible organic soils on the performance of the proposed pipeline system and culvert. These materials will not offer satisfactory support to the settlement sensitive pipeline system. Therefore, we recommend that the organic soils encountered be completely removed and replaced with select granular fill materials. The select granular fill materials shall be in accordance with Section 13.3 of this report. If the organic soil materials are not completely removed, settlements are expected to occur to proposed pipeline distribution system. At this point we have not been provided with specific details of the proposed pipeline system such as the proposed invert elevations.

11.2 Allowable Bearing Capacity

After the complete removal of the organic soil materials along the alignment of the proposed delivery pipeline system in accordance with Section 8.1.1, the proposed pipeline system may rest on the surface of select fill materials, the existing granular soils or on the surface of the natural limestone formations. We recommend that the delivery pipeline system be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf) when resting on the surface of granular soils or 5,000 psf when resting on the surface of the natural Miami and Fort Thompson Limestone Formations. Settlements will be less than about 1 inch based on the allowable bearing capacities ranging from 3,000 to 5,000 psf.

12.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS FOR CANAL CROSSING

12.1 General

Based on information provided by SRS Engineering, Inc., we understand that the canal crossing will consist of a temporary bailey bridge supported by a shallow foundation system. Based on the results of our field study, a shallow foundation system is feasible for support of the proposed temporary bridge. It should be noted that unsuitable organic soils were encountered in the test boring BB-2 performed for the temporary bridge at depths ranging from 2 to 5 feet below existing grade. These unsuitable organic soils (OL/PT) shall be completely removed and replaced with select fill materials in accordance with Section 8.1.1 of this report.

12.2 Foundation Design

We understand that the proposed temporary bailey bridge will be supported by a shallow foundation system. We believe that this type of foundation is feasible; however, it will require the complete removal of unsuitable organic soils (OL/PT) encountered at the site of the proposed bridge footprints. Our foundations analyses were performed using Allowable Stress Design. The shallow foundation analyses assume the groundwater table at the foundation bearing levels. Furthermore, we are assuming that the temporary spread footings will be located on horizontal ground and will be protected from the effects of scour.

We recommend that footings bearing on granular soils be designed using an allowable bearing capacity of 3,000 psf when resting on the surface of compacted structural fill materials or an allocable bearing capacity of 5,000 psf when bearing on the surface of the natural limestone formation. The weight of the footing and soil backfill may be neglected in the foundation sizing computations. The allowable bearing capacity refers to dead and normal live load conditions. It may be increased by 25 percent for total loads, including wind forces.

12.3 Settlement

The amount of settlement that a mat foundation founded on top of acceptable compacted structural fill or on the surface of the natural limestone formation will experience is primarily governed by the compressibility of granular fill materials, the sizes and depths of the foundations, and the pressure imposed on the supporting materials. We have compared the data obtained from the SPT borings performed with our foundation design experience with similar structures founded on top of granular materials.

Footings designed with the criteria in Section 12.1 and constructed in the manner recommended in Section 13.0 are estimated to sustain maximum total settlements in the range of one (1) inch, which correspond to the allowable bearing capacities ranging from 3,000 to 5,000 psf. Differential settlement across the mat foundation is expected to be one-half of the total settlement. Distortions that occur along the foundation should not be more than 1 in 1000.

Granular fill materials which will provide support to the footings have low compressibility and any settlement due to pressure applied by the foundations is likely to occur almost immediately upon application of the loads. In this case, nearly all of the settlement of the foundations due to dead loads is expected to take place during construction. The portion of the settlement due to the live loadings of the structure will generally take place soon after the first application of this load.

13.0 CONSTRUCTION CONSIDERATIONS

13.1 Site Preparation

We recommend that any existing topsoil, grass, vegetation system, and buried substructure (if any) be stripped from the proposed improvement areas. After stripping is completed, the surface soils in areas of the proposed pipelines and structure foundations should be leveled and densified prior to the placement of the fill. Where the above site preparation procedures creates excavations below the final proposed grade, the excavations should be brought to final grade with structural fill as specified in Section 13.3 of this report.

It should be noted that test borings performed for the proposed well buildings, pipelines and canal crossing encountered organic soils to depths ranging from about 2.5 to 6 feet below existing grades. These materials shall be completely removed below the invert elevation of the proposed wells, pipes and canal crossing temporary bridge foundations and replaced with select fill materials in accordance with this 13.3 of this report. These materials will not offer satisfactory support for the pipelines/canal crossing foundations due to their low strength and compressible characteristics.

13.2 In-Situ Densification of Soils

The granular soils at the exposed surfaces in the foundation footprint plus a 10-foot wide perimeter extending beyond the outer lines of the foundation should be densified with a self-propelled vibratory roller which imparts a dynamic drum force of not less than 20,000 pounds. Any compaction that takes place within a distance of 25 feet from any utility should be compacted with a vibratory plate or a small walk behind vibratory roller to avoid damage.

Compaction of the bearing surface soils should continue until no further vertical settlement of that surface is visually discernible. Density control should be exercised in the upper 12 inches of the subgrade. Soils in this interval should be compacted to 95 percent of the Modified Proctor maximum dry density determined by ASTM D-1557. Addition of moisture by frequent wetting of the subgrade may be necessary during the rolling operations to prevent drying and loosening of the upper 6 to 12 inches of soil.

13.3 Structural Fill and Backfill

Proper control of the placement and compaction of new fills for the project should be exercised by a representative of the Geotechnical Engineer from GEOSOL. The fill materials should be placed in lifts not exceeding 12 inches in loose thickness. Each lift should be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density near the optimum moisture content as determined by ASTM D-1557. Fill to be compacted with a vibratory plate or a small walk behind vibratory roller should be placed in lifts not exceeding six (6) inches in loose thickness. The tests should be performed by a qualified soils technician from this office working under the supervision of a Geotechnical Engineer from our office in accordance with appropriate ASTM procedures. Any fill indicating less than the recommended relative compaction should be re-compacted until the required density is obtained prior to the placement of subsequent lifts or concrete for the substructure.

The structural fill should be free of organic matter and consist of granular soil containing less than 12 percent material passing the No. 200 mesh sieve. The fill material may be composed of either clean sands or crushed limerock. The crushed limerock should have no particle size in excess of three inches. The structural fill should have a Unified Soil Classification System (USCS) designation of GP or GW, SP, SW, GP-GM, GW-GM, SW-SM or SP-SM. Any fill placed under the groundwater table at the time of construction to an elevation of one (1) foot above the groundwater table shall have less than 10 percent material passing through the No. 200 mesh sieve and shall consist of crushed limerock having a USCS designation of GP, GW, GP-GM or GW-GM.

13.4 Excavation Recommendations

Temporary excavation side slopes of 1V: 2H in the granular subsurface materials, 1V:3H in the organic soil (OL/PT) materials, and 1V:1H in the natural Miami and Fort Thompson Limestone Formations are stable and have a minimum factor of safety of 1.3. If steeper sides are used, the excavations will require the need of temporary ground support systems in order to maintain the stability of the excavations and for safety reasons. The Contractor is responsible for the design of the temporary ground support system. Based on the results of the soil borings, an unsupported vertical cut is not considered stable or safe during construction. An unsupported vertical cut will cause cracks on the ground surface because the angle of repose of the granular soils will be exceeded and a failure surface will develop behind the vertical face of the excavation. Materials removed from the excavation should not be stockpiled immediately adjacent to the cut, inasmuch as this load may cause a sudden collapse of the temporary ground support system. Open excavations shall be backfilled as soon as possible to prevent instability, which may cause collapse of the excavations and injury to people. The Contractor is responsible for backfilling the excavation in a timely fashion such that cut instability (excavation failure) will not occur. The Contractor shall be aware that special equipment may be required to excavate the natural Miami and Fort Thompson limestone formations due to the relatively high strength of the rock layers. The temporary ground support system should be in conformance with the Occupational Safety and Health Administration (OSHA) Standards.

13.5 Groundwater Control

For the pipeline installation and shallow foundation construction, it is anticipated that dewatering may be required. Successful removal of the existing subsurface materials and installation of the proposed pipeline/shallow foundations may necessitate that the work be performed in-the-dry, thereby possibly requiring temporary lowering of the groundwater table in the proposed excavation areas. Dewatering may be required for the construction of the pipeline/shallow foundation depending on the construction technique used, the invert elevation of the proposed pipeline/ shallow foundation and the time of the year when the construction occurs. De-watering involves lowering the ambient groundwater table below the existing groundwater levels. This may be accomplished through use of a wellpoint system or relatively large submersible pump. The water from the on-site dewatering operations should be directed to a suitable discharge point and must be adequate to satisfy any local, state or federal regulatory agency. The Contractor shall be aware that dewatering of the Miami and Fort Thompson Limestone Formations may be difficult given the highly porous nature of the rock formations.

More rigorous dewatering control system may require the use of temporary sheet piles and placement of a concrete tremie seal. We recommend that the groundwater should be maintained at the following levels:

- At least one (1) feet below the bottom of any excavation made during construction operations and
- At least two (2) feet below the surface of any vibratory compaction operations.

13.6 Shallow Foundation Construction

The mat foundations for the proposed well structures may bear on structural fill materials, on the surface of the existing granular fill materials or on the natural rock formation. Also, the spread footings for the proposed temporary bridge may bear on the surface of compacted structural fill materials or on the surface of the natural limestone formation. It is recommended that the structural fill at the bottom of the foundation excavation be compacted in-place. These fill materials should be compacted to achieve not less than 95 percent of the modified Proctor maximum dry density as determined by ASTM designation D-1557. Any fill placed under the groundwater table at the time of construction to an elevation of one (1) foot above the groundwater table shall have less than 10 percent material passing through the No. 200 mesh sieve and shall consist of crushed limerock having a USCS designation of GP, GW, GP-GM or GW-GM. If the footing bearing materials becomes disturbed due to surface water resulting from precipitation and runoff, the disturbed soils should be overexcavated and replaced with compacted crushed limerock.

13.7 Augercast Pile Installation

Recommendations for ACIP pile installation are presented hereafter.

- We recommend that the piles be spaced at least 2.5-pile diameters center-to-center to minimize pile capacity reduction caused by group effects. A placement tolerance with respect to the design center of 3 inches should be specified for group piles and one (1) inch for isolated piles unless more stringent construction positioning is required. Out-of-plumbness for the piling should be limited to two (2) percent maximum.

- The 28-day compressive strength of the grout used in the piles should be at least 5,000 pounds per square inch (psi).

- In order to provide some assurance that the piles has been constructed with a continuous cross section a full-length steel reinforcing bar or cage should be installed at the center of each pile immediately after grouting. Centralizers should be attached to individual bars at the bottom and at third points.

- Piles subject to uplift loading must be provided with adequate reinforcing steel throughout their entire length.

13.8 Drilling and Grouting

Augercast piles are constructed by rotating a hollow-stem continuous flight auger into the ground until the planned tip depth or termination criterion is achieved. At the termination depth, a grout with high fluidity is pumped under pressure into the hole through the hollow stem auger. As long as pressure is observed in the line, the auger is slowly withdrawn up the hole and the augercast shaft is constructed.

Grout volumes, possibly up to 1.5 times the theoretical pile volume, may be required for proper pile installation. A grout factor equal to or greater than that of the successful test piles should be obtained for the production piles. The grout factor is defined as the actual volume of grout pumped into the pile divided by the theoretical volume of the drilled hole.

After achieving the desired depth, a positive grout pressure should be observed prior to initiating withdrawal of the auger. A continuous fluid return consisting of slurry and then grout at the top of the hole is the best indication that the desired pressure head is being achieved. The auger should be withdrawn slowly so that a positive grout pressure is maintained in the hole at all times during auger withdrawal. If the withdrawal of the auger becomes erratic, grout pressure suddenly drops, or if the grout is interrupted, the auger tip should be reinserted at least five (5) feet below the level where the grouting operation was disrupted prior to resuming withdrawal of the auger.

The installation of adjacent piles located within four (4) pile diameters of each other on the same working day is not recommended. We recommend that adjacent piles located within four (4) pile diameters not be installed until the initial grouted pile has set at least 12 hours.

Some subsidence of fresh grout may occur in the top of the piles. This subsidence is in part a result of the weight of the grout column "pushing" laterally into subsurface material layers. We anticipate that subsidence will occur within a period of approximately two hours following the grouting operation. If subsidence occurs while the pile grout is in a fluid state, we recommend that the pile be immediately filled with fresh grout to the proper cutoff elevation. We recommend that a pile grout subsidence of up to eight (8) inches be considered acceptable. Grout should not be pumped into the piles when it is older than 90 minutes from the time it was batched. Prior to actual installation of the piles, The Contractor should demonstrate that the materials and equipment proposed for use are capable of installing the production piles. The Contractor should provide an accurate method of determining the depth and alignment of the auger.

13.9 Augercast Pile Monitoring

The successful ACIP pile installation will in large part depend upon the expertise of The Contractor and the techniques that are used. Because of the possibility of soil intrusions during auger withdrawal and non-vertical piles, the job specifications must be carefully prepared and continuous inspections made of the installation. Full-time inspection must be maintained during installation to monitor depths, the number of strokes every five (5) feet of pile length, and the amount of grout pumped versus the rate of auger withdrawal. The full-time monitoring of pile installation will provide a degree of assurance that continuous piles of the proper cross-section are being constructed.

We recommend that the grout pump be calibrated in the presence of a Geotechnical Engineer prior to initiation of the test and production pile installations. At least two (2) sets of 4-inch diameter x 8 inch high grout cylinders be made for every 50 cubic yards of pile installation.

13.10 Test Pile Program

Construction documents produced for the project should include provisions for an indicator pile program. The indicator piles should be placed at non-production pile locations and near the exploratory borings so that the drilling characteristics can be directly correlated to known subsurface conditions. The drilling of the indicator piles should be performed under the direct supervision of a Geotechnical Engineer from this office that is familiar with the subsurface conditions encountered at the site. Once final design details are available, The Geotechnical Engineer of Record shall provide recommendations regarding the number, locations and depths of indicator piles for this project. As a minimum, a total of four (4) grouted indicator piles should be installed prior to the start of production pile installation to demonstrate the augercast pile installation procedures.

We recommend that a test pile program be performed to confirm the length and load carrying capacity of the ACIP piles. As a minimum, we recommend the performance of fully instrumented compression and tension load testing for the ACIP piles. As a minimum, the augercast pile load test program should include a total of one (1) compression load test (ASTM D-1143) and one (1) tension load test (ASTM D-3689). Once final design details have been finalized, the Geotechnical Engineer of Record shall provide recommendations regarding the number, location and pile lengths for the load tests to performed for this project. The test piles would be loaded to at least twice the design load. The grouted pile should be subjected to a full scale static compression and tension load test pursuant to the requirements of ASTM D-1143, ASTM D-3689 and the Florida Building Code (FBC) under the direct supervision of a Geotechnical Engineer from our office. The purpose of the grouted test piles is to evaluate the load deformation behavior as well as the load distribution of this foundation element as compared to production piles. Therefore, it is imperative that the cut off elevations of the test piles be the same as that of the production piles. Based on the results of the load testing and the installation of the indicator piles, the Geotechnical Engineer would then provide additional installation criteria (i.e. rock socket length, minimum grout factor, revised termination criteria, etc.) for the production piles, if necessary.

Alternatively, if it is desired to eliminate the test pile program, the allowable compression and tension capacities of the ACIP piles may be limited to 35 tons and 15 tons, respectively. In accordance with the Florida Building Code, load testing of ACIP pile foundations are not required if design loads do not exceed 35 tons.

14.0 RECOMMENDATIONS FOR RETAINING WALLS

We understand retaining walls may be required as part of the wall head construction. In the event that they are needed, retaining walls may be designed using the soil/rock parameters presented in Table "A" of this report.

15.0 ON SITE SOIL SUITABILITY

All materials to be used for backfill or compacted fill construction should be evaluated and, if necessary, tested by GEOSOL prior to placement to determine if they are suitable for the intended use. Based on the results of our study, organic soils were encountered along the alignment of the proposed pipeline system and the canal crossing. The organic soils are unsuitable to be used as subgrade fill or backfill materials. Suitable structural fill materials should consist of limerock and fine to medium sand with less than twelve (12) percent passing the No. 200 sieve, free of rubble, organics, clay, debris and other unsuitable material. Any off-site materials used as fill should approved by GEOSOL prior to acquisition.

16.0 RECOMMENDATIONS FOR FURTHER GEOTECHNICAL STUDIES

At the time of our study, the majority of the site for the proposed Well Nos. 8, 9, 12 and 13 and associated pipelines was inaccessible to truck and All-Terrain Vehicle (ATV)-mounted drilling equipment due to the wet ground and soft, highly compressible muck that was at the ground surface at the time of our study. Therefore, we recommend that after all demucking operations have been performed and prior to the construction of the well structures/pipelines, additional borings be performed to check that all unsuitable soils (OL/PT) have been completely removed. The supplemental geotechnical study shall consist of performing Standard Penetration Test (SPT) borings at each well location along with SPT borings at 500-foot intervals along the alignment of the proposed pipelines. After the supplemental boring have been provided and the data reviewed, additional geotechnical recommendations may be warranted based on the findings.

17.0 GENERAL CONDITIONS

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with general accepted professional practice in the field of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

After the plans and specifications are complete and the final design details are available, it is recommended that GEOSOL be provided the opportunity to review the final design and specifications, in order to verify that the earthwork and foundation recommendations are properly interpreted and implemented.

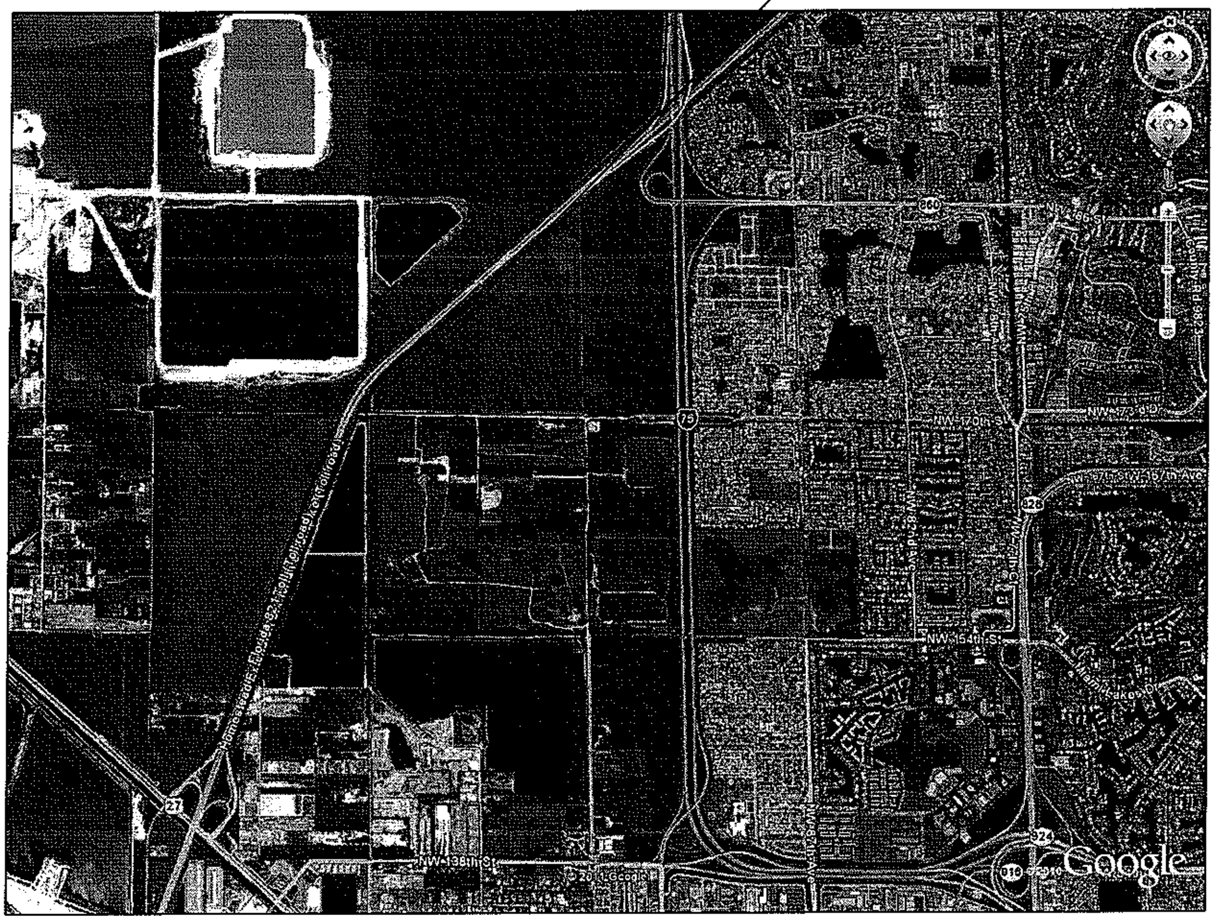
This report has been prepared for the proposed Well Nos. 8, 9, 12 and 13; associated pipeline distribution system; and canal crossing that will be connected to the Reverse Osmosis Water Treatment Plant in the City of Hialeah, Florida.

APPENDIX "A"

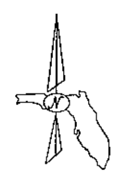
Sheet 1: Site Vicinity Map
Table 1 – Summary of Test Boring Locations
Sheets 2 through 7: Boring Location Plans
Sheet 8: Report of Core Borings
Table 2 – Summary of Hand Auger Boring Results
Correlation of Penetration Resistance with Relative Density of Granular Soils and Consistency of Cohesive soils
Drilling and Sampling Procedures, Field Tests and Measurements

GEOSOL, Inc.

APPROXIMATE SITE LOCATION



SITE VICINITY MAP



COUNTY: MIAMI-DADE COUNTY, FLORIDA

REFERENCE: GOOGLE EARTH, 2010

DATE: JULY, 2011

SITE VICINITY MAP

CITY OF HIALEAH REVERSE OSMOSIS WATER TREATMENT PLANT DESIGN OF RAW WATER TRANSMISSION MAIN, WELL MAINTENANCE PIPELINE AND WELL SITE DEVELOPMENT
MIAMI-DADE COUNTY, FLORIDA

GEOSOL, INC.

DRAWN	SCALE	PROJ. No.
RV	N.T.S.	211130
CHECKED OR	DATE MAY, 2012	SHEET 1

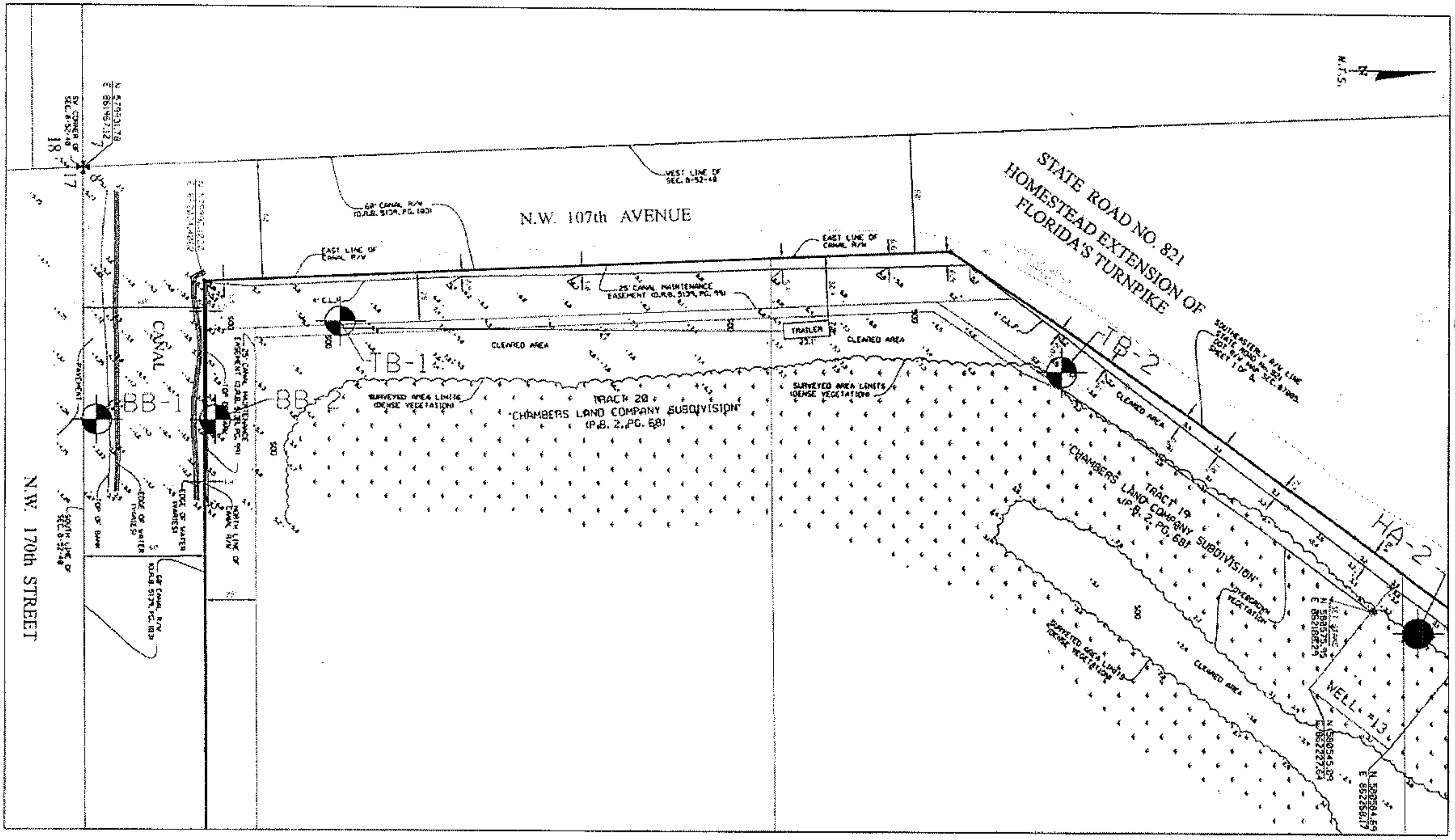
CITY OF HIALEAH REVERSE OSMOSIS WATER TREATMENT PLANT
DESIGN OF RAW WATER TRANSMISSION MAIN, WELL MAINTENANCE PIPELINE AND WELL SITE DEVELOPMENT
GRAHAM PROPERTY - VICINITY OF NW 107TH AVE. AND NW 170TH ST.
PROPOSED WELL Nos. 8, 9, 12 AND 13; PIPELINES; AND CANAL CROSSING
CITY OF HIALEAH, FLORIDA
GEOSOL PROJECT No. 211130

GEOSOL, Inc.

TABLE 1 - SUMMARY OF TEST BORING LOCATIONS

BORING No.	"AS-DRILLED" TEST COORDINATES (NAD-83/90 FL-0901 EAST ZONE)		GROUND SURFACE ELEVATION (FEET; NGVD, 1929)
	NORTHING (FEET)	EASTING (FEET)	
BB-1	579938.829	862094.558	3.9
BB-2	579997.491	862094.558	5.7
SB-1	580059.491	862044.558	5.6
SB-2	580421.246	862067.875	5.6
HA-2	580598.970	862199.012	3.3
HA-3	580991.293	862530.024	3.0
HA-4	581335.276	862897.499	3.3
HA-5	581688.234	863280.868	2.7
HA-6	582026.041	863644.495	2.4
HA-7	582370.672	864030.852	1.9
HA-8	582713.748	864394.460	2.1
HA-9	582794.370	864481.649	2.0

Notes:
1) Northing and easting coordinates obtained by converting latitude and longitude coordinates obtained with a hand-held GPS device and should be considered approximate.
2) Ground surface elevations obtained from site survey provided by PARSONS and should be considered approximate.



LEGEND

- TB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED WELLS AND PIPELINE
- BB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED CANAL CROSSING
- HA-1 APPROXIMATE HAND AUGER TEST LOCATION

CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

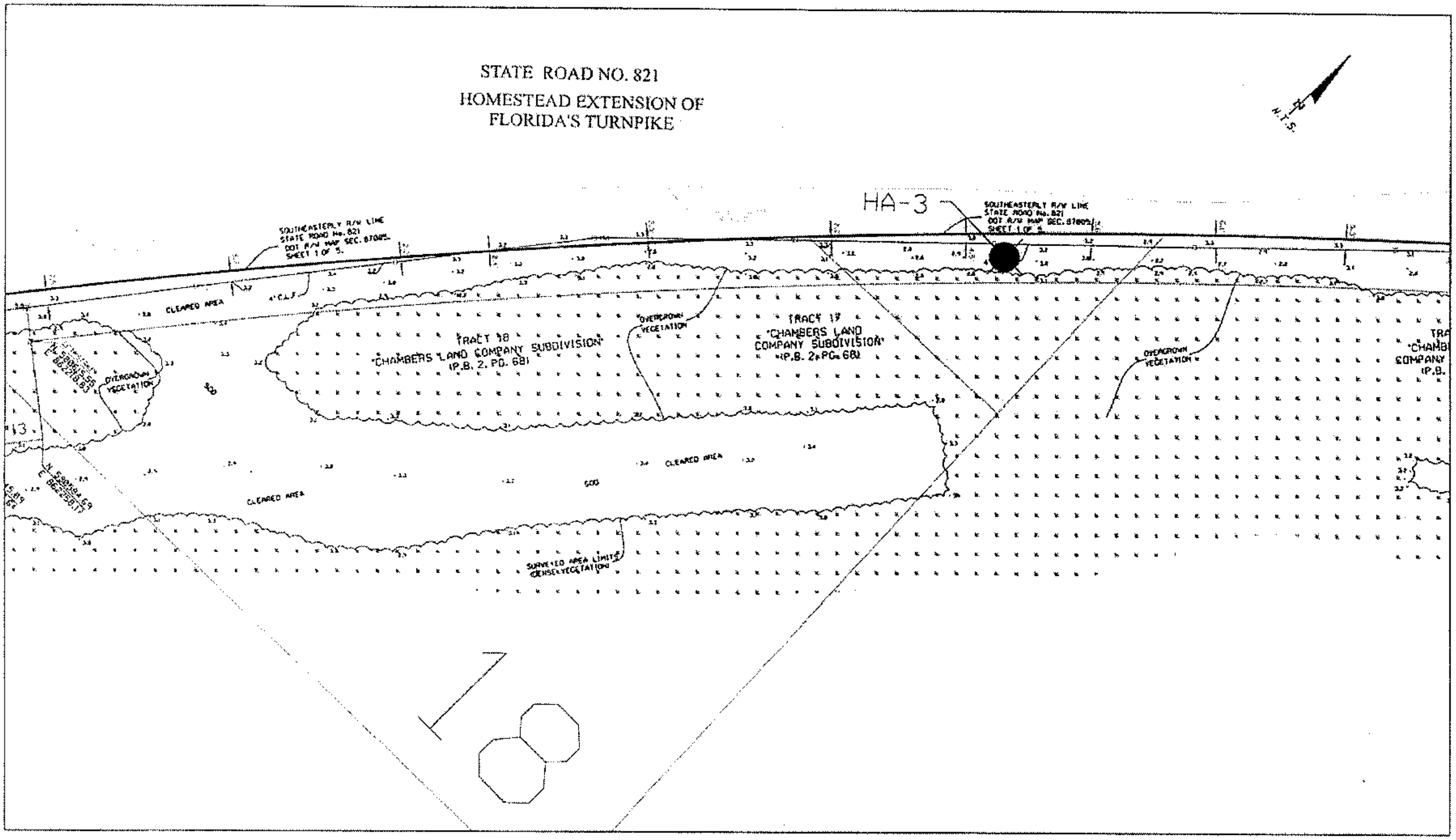
BORING LOCATION PLANS

WATER AND SEWER DEPARTMENT

ENGINEER OF RECORD:
GEOSOL, INC.

NOT FOR CONSTRUCTION

Drawing No. 2



LEGEND

- TB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED WELLS AND PIPELINE
- BB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED CANAL CROSSING
- HA-1 APPROXIMATE HAND AUGER TEST LOCATION

WATER AND SEWER DEPARTMENT

ENGINEER OF RECORD:
GESSOL, INC.
ORACIO RICCOBONO, P.E.
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MIAMI LAKES, FL 33014
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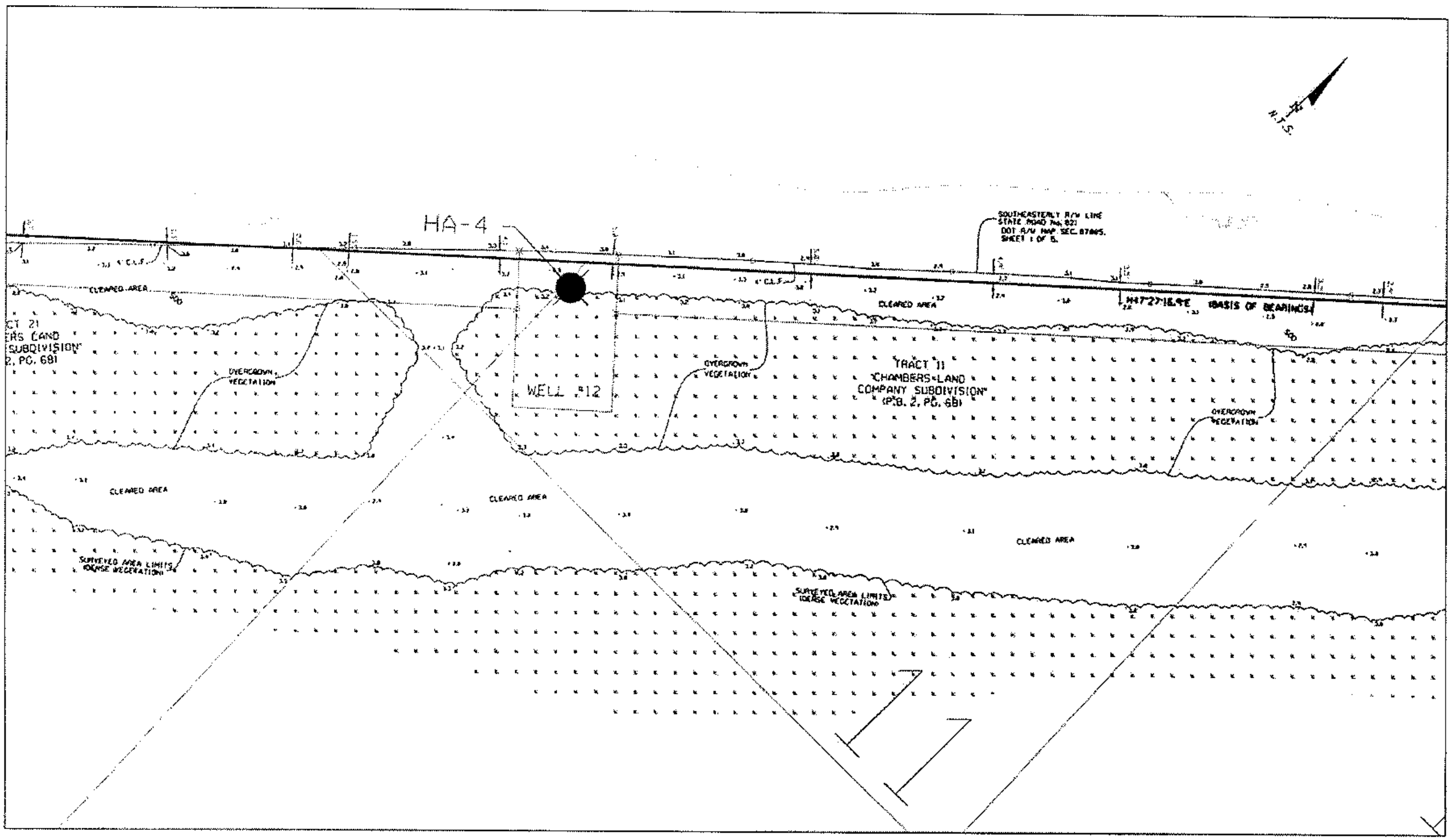
CERTIFICATE OF AUTHORIZATION 8530

NOT FOR CONSTRUCTION

CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

BORING LOCATION PLANS

Drawing No. 3



LEGEND

- TB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED WELLS AND PIPELINE
- BB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED CANAL CROSSING
- HA-1 APPROXIMATE HAND AUGER TEST LOCATION

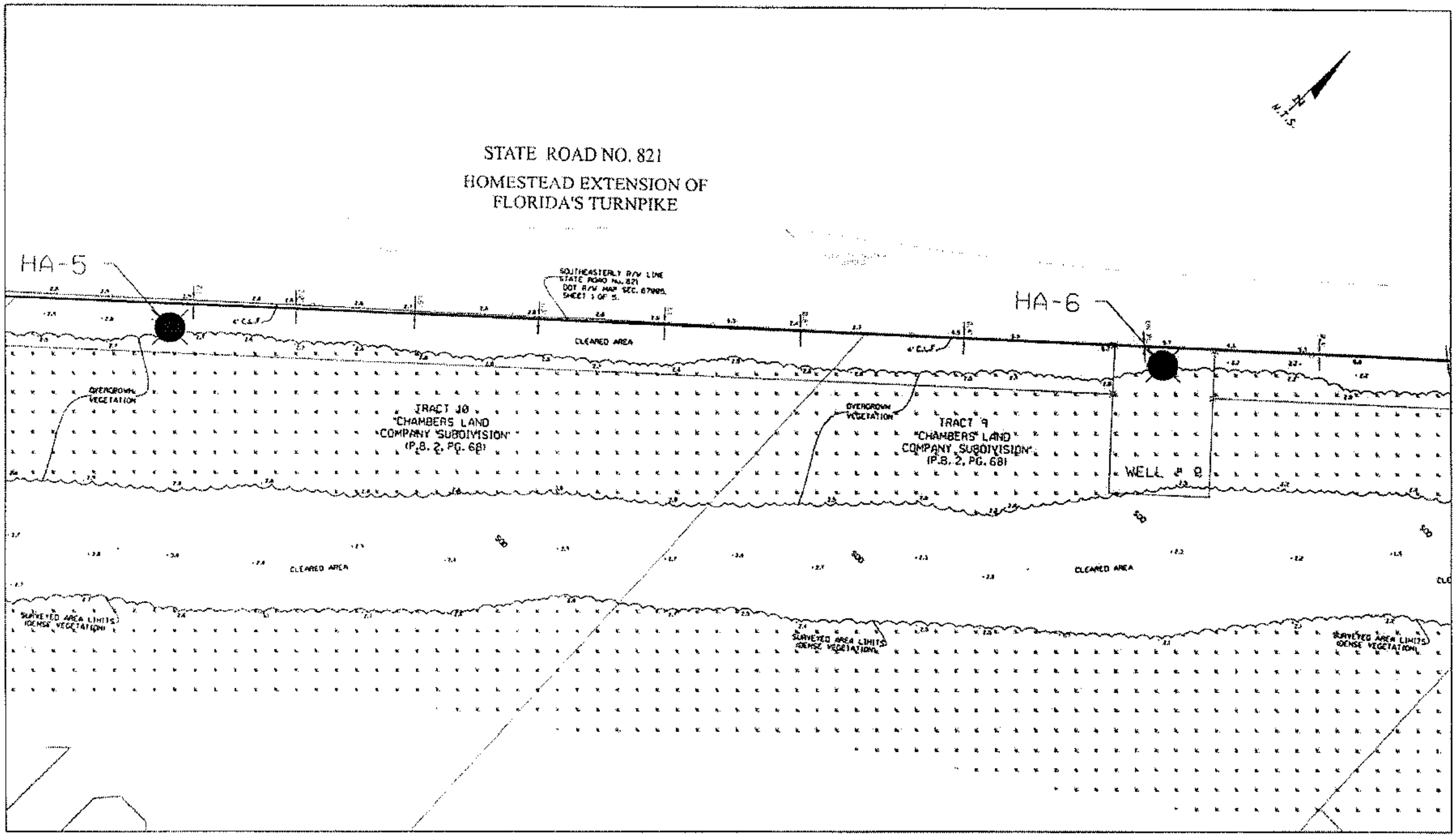
NOT FOR CONSTRUCTION

WATER AND SEWER DEPARTMENT

CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

BORING LOCATION PLANS

Drawing No. 4



LEGEND

- TB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED WELLS AND PIPELINE
- BB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED CANAL CROSSING
- HA-1 APPROXIMATE HAND AUGER TEST LOCATION

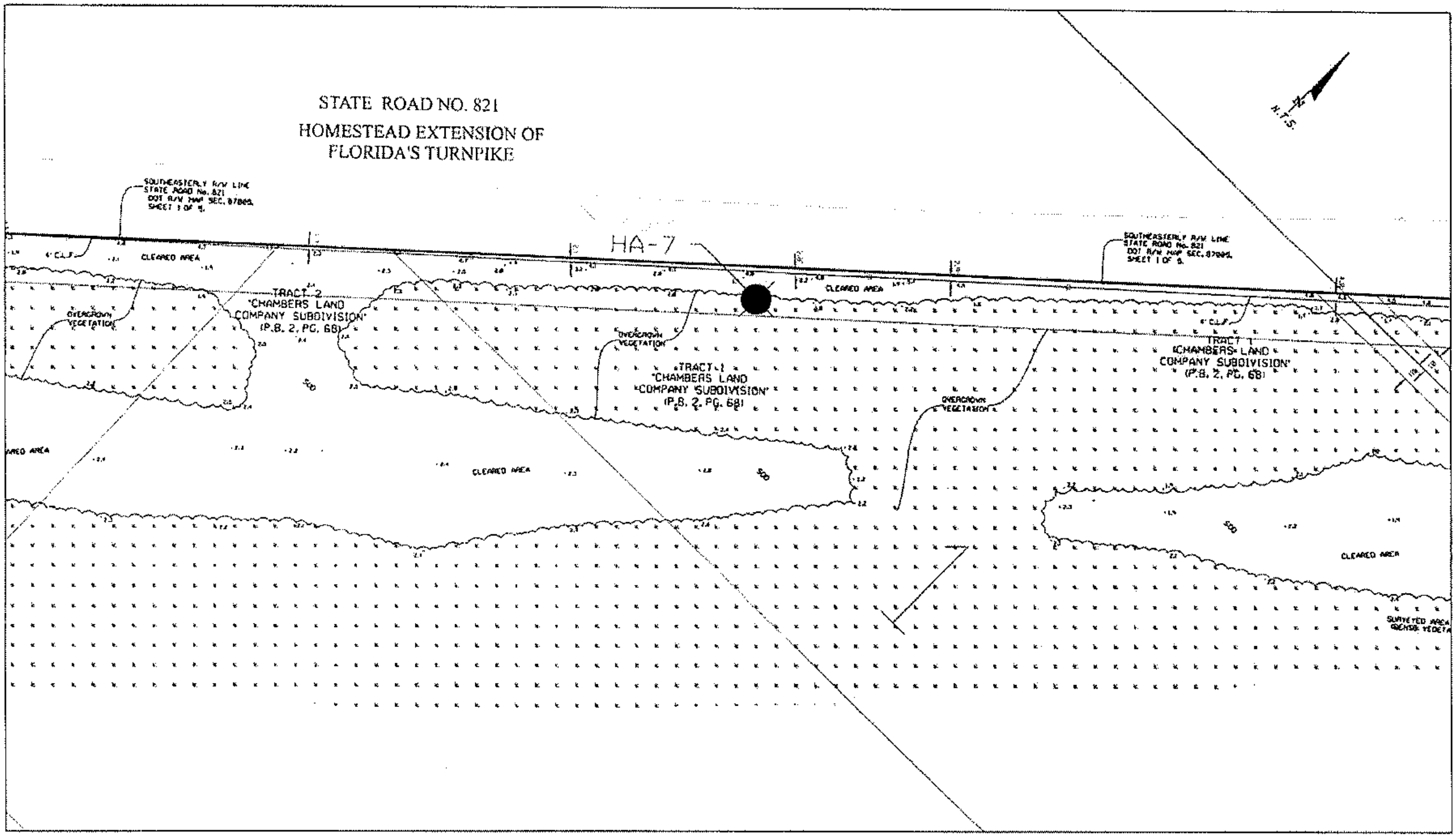
CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

BORING LOCATION PLANS

WATER AND SEWER DEPARTMENT

NOT FOR CONSTRUCTION

Drawing No. 5



LEGEND

- TB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED WELLS AND PIPELINE
- BB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED CANAL CROSSING
- HA-1 APPROXIMATE HAND AUGER TEST LOCATION

WATER AND SEWER DEPARTMENT

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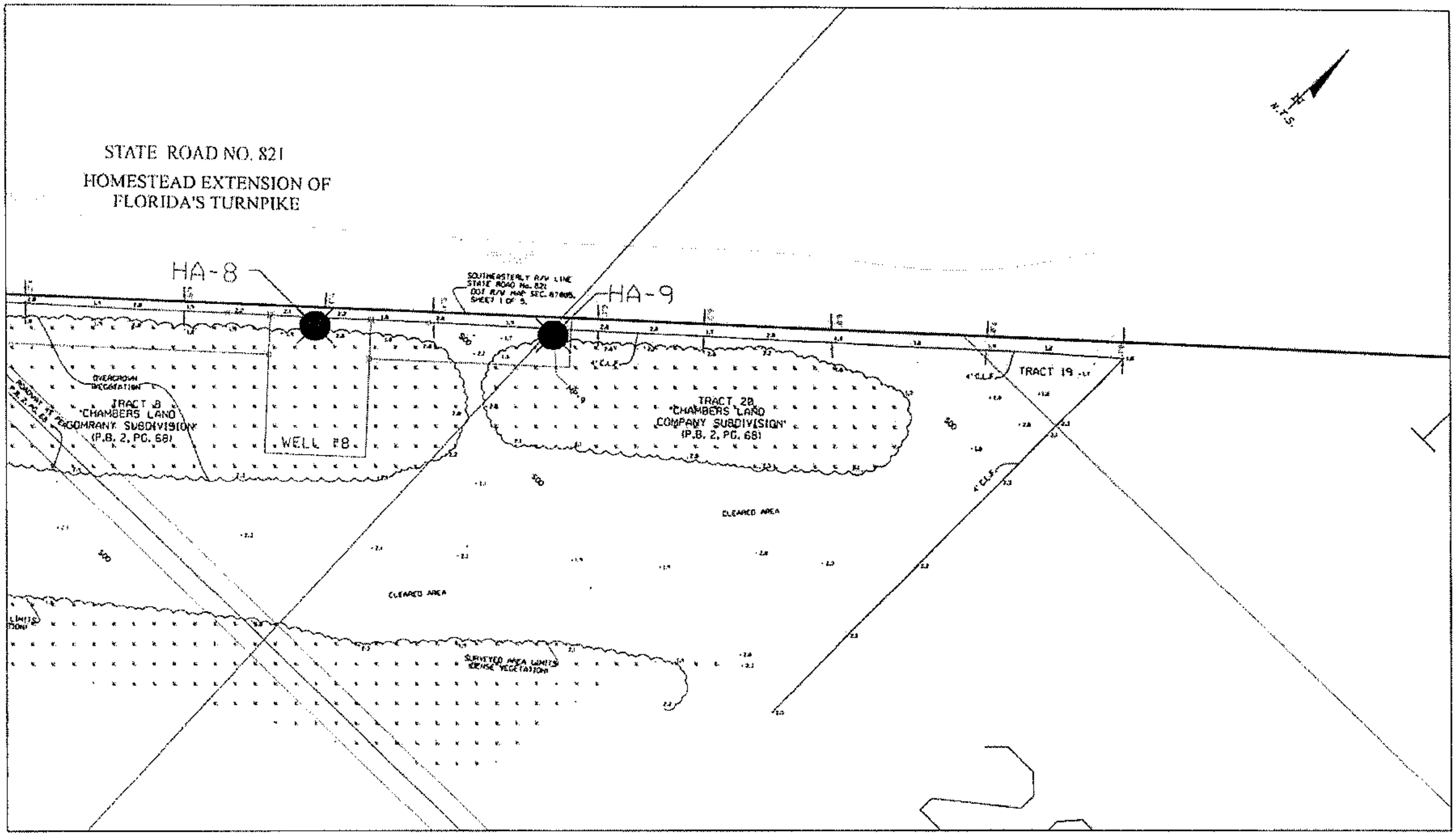
CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

BORING LOCATION PLANS

Drawing No. 6



LEGEND

- TB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED WELLS AND PIPELINE
- BB-1 APPROXIMATE TEST BORING LOCATION FOR PROPOSED CANAL CROSSING
- HA-1 APPROXIMATE HAND AUGER TEST LOCATION

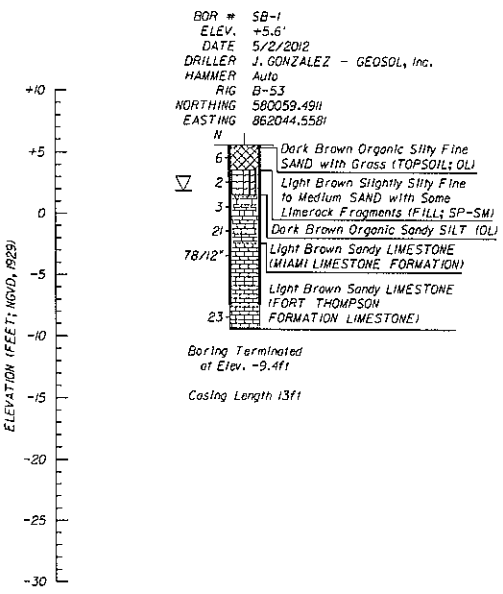
CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

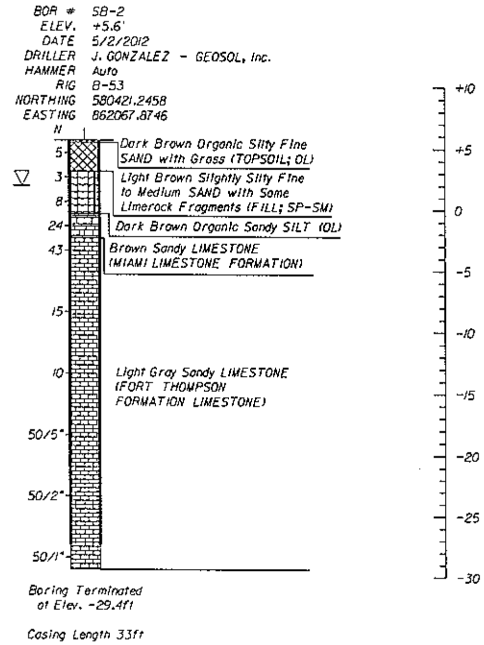
BORING LOCATION PLANS

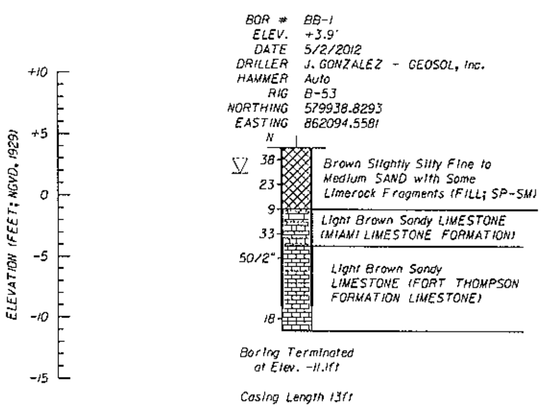
WATER AND SEWER DEPARTMENT

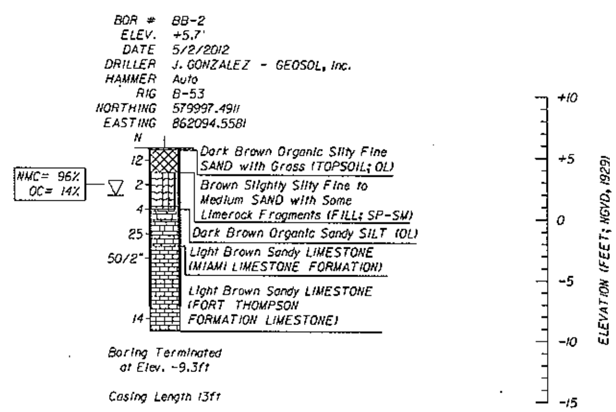
NOT FOR CONSTRUCTION

Drawing No. 7 REV.









LEGEND

- TOPSOIL (OL)
- FILL (SP-SM)
- ORGANIC SOIL (OL)
- MIAMI LIMESTONE FORMATION
- FORT THOMPSON FORMATION LIMESTONE

NOTES:

1) SPT BORINGS PERFORMED PER ASTM D-1586 WITH A HAMMER WEIGHT OF 140 LBS FALLING 30 INCHES.

▽ WATER TABLE AT TIME OF DRILLING

| | CASING USED

N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12" PENETRATION (UNLESS OTHERWISE NOTED).

NMC NATURAL MOISTURE CONTENT (%)

OC ORGANIC CONTENT (%)

ENVIRONMENTAL CLASSIFICATION:

SUPERSTRUCTURE: SLIGHTLY AGGRESSIVE
SUBSTRUCTURE: MODERATELY AGGRESSIVE

WATER:

pH:	7.5-8.8
CHLORIDE:	45-56 PPM
SULFATE:	53-171 PPM
RESISTIVITY:	1,390-2,150 OHM-CM
REDOX POTENTIAL	225-290 mV

0 2 10
Feet
VERTICAL SCALE
HORIZONTAL SCALE: N.T.S.

GRANULAR MATERIALS-RELATIVE DENSITY	AUTOMATIC SPT HAMMER (BLOWS PER FOOT)
VERY LOOSE	LESS THAN 3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTANCY	**AUTOMATIC SPT HAMMER (BLOWS PER FOOT)**
VERY SOFT	LESS THAN 1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	GREATER THAN 24

REV	DATE	DESCRIPTION	BY

JOB No. 280283
DESIGNED
DRAWN
CHECKED
REVIEWED
DATE

ENGINEER OF RECORD:
GEOSOL, INC.
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CERTIFICATE OF AUTHORIZATION 8530

WATER AND SEWER DEPARTMENT

CITY IF HIALEAH, FLORIDA
DESIGN, BUILD, OPERATE PROJECT DEVELOPMENT
REVERSE OSMOSIS WATER TREATMENT PLANT

REPORT OF CORE BORINGS

Sheet No. 8
REV.

CITY OF HIALEAH REVERSE OSMOSIS WATER TREATMENT PLANT
DESIGN OF RAW WATER TRANSMISSION MAIN, WELL MAINTENANCE
PIPELINE AND WELL SITE DEVELOPMENT
GRAHAM PROPERTY - VICINITY OF NW 107TH AVE. AND NW 170TH ST.
WELL Nos. 8, 9, 12 AND 13; PIPELINES; AND CULVERT CROSSING
CITY OF HIALEAH, FLORIDA
GEOSOL PROJECT No. 211130

GEOSOL, Inc.

TABLE 2 - SUMMARY OF HAND AUGER BORING RESULTS

BORING No.	DATE	DEPTH (INCHES)		THICKNESS (INCHES)	MATERIAL DESCRIPTION
		FROM	TO		
HA-1	5/2/2012	TEST BORING TB-1 PERFORMED AT THIS LOCATION			
HA-2	5/2/2012	0	30	30	Dark Brown Peat (PT)
HA-3	5/2/2012	0	30	30	Dark Brown Peat (PT)
HA-4	5/2/2012	0	32	32	Dark Brown Peat (PT)
HA-5	5/2/2012	0	31	31	Dark Brown Peat (PT)
HA-6	5/2/2012	0	37	37	Dark Brown Peat (PT)
HA-7	5/2/2012	0	37	37	Dark Brown Peat (PT)
HA-8	5/2/2012	0	38	38	Dark Brown Peat (PT)
HA-9	5/2/2012	0	37	37	Dark Brown Peat (PT)

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY OF GRANULAR SOILS

RELATIVE DENSITY	STANDARD PENETRATION TEST BLOWS/FT. AUTOMATIC HAMMER (N-VALUE)
Very Loose	0 - 3
Loose	3 - 8
Medium Dense	8 - 24
Dense	24 - 40
Very Dense	Over 40

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DRILLING AND SAMPLING PROCEDURES

The test borings were performed with a truck-mounted drilling rig equipped with a rotary head. The drill holes were advanced by the use of a high-speed rollercone bit, with bentonite drilling fluid being pumped through the drill rods to remove the cuttings. During the performance of the test borings, temporary steel casing was used to stabilize the sidewalls of the boreholes. Representative samples were obtained by the use of split-barrel sampling procedures in general accordance with the procedures for "Penetration Test and Split-Barrel Sampling of Soils" (ASTM D-1586).

FIELD TESTS AND MEASUREMENTS

Field Test Locations – The test boring locations were selected by PARSONS and were marked in the field by representatives of our firm, standard taping procedures and existing landmarks. Northing and easting coordinates for each test location were obtained by converting latitude and longitude coordinates obtained by means of a hand-held GPS device and were converted to northing and easting coordinates utilizing the software "Corpscon" developed by the United States Army Corps of Engineers and should be considered approximate.

Standard Penetration Tests - During the sampling procedure, Standard Penetration Tests (SPT) were performed at pre-determined intervals to obtain the standard penetration value (N) of the soil. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty (30) inches, required to advance the split-barrel sampler one (1) foot into the soil. The sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows were recorded for each of four (4) successive increments of six (6) inches penetration. The "N"-value is obtained by adding the second and third incremental numbers. The first six (6) inches of penetration are discarded to account for disturbed soil that has fallen down the open borehole during sampling. All SPT borings were performed with the use of an automatic hammer. After completion of the test borings, the boreholes were backfilled with grout and the site was restored as required. All soil samples were classified in the field and placed in airtight containers for transportation and laboratory testing.

Hand Auger Borings - A hand auger boring was performed in areas inaccessible to truck-mounted drilling equipment. The hand auger borings were terminated upon reaching hand refusal conditions and were performed by advancing a rotating sampler slowly into the ground in a "corkscrew" fashion. The sampler was then retrieved and a representative sample was obtained. The hand auger borings were performed in general accordance with the ASTM test designation D-1452. All soil samples were classified in the field and placed in airtight containers for transportation and laboratory testing. Detailed information about the subsurface conditions encountered is included in Table 2 of Appendix "A" of this report.

Water Level Measurements - Water level depths were obtained during the test boring operations. In relatively pervious soils/rocks, such as sandy soils and porous limestone, the indicated depths are usually reliable groundwater levels. Seasonal variations, tidal conditions, temperature, land-use, and recent rainfall conditions may influence the depths to the groundwater.

Ground Surface Elevations - Ground surface elevations at each test boring location were obtained from a site survey provided by PARSONS and should be considered approximate. All references to depth of the various strata and materials encountered are from existing grade at the time of drilling.

APPENDIX "B"

Table 3 – Summary of Laboratory Test Results
Table 4 – Summary of Environmental Classification Test Results
Moisture Content Test Results
Organic Content Test Results

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TABLE 3 - SUMMARY OF LABORATORY TEST RESULTS
CITY OF HIALEAH REVERSE OSMOSIS WATER TREATMENT PLANT
PROPOSED WELL Nos. 8, 9, 12 AND 13; ASSOCIATED PIPELINES; AND CANAL CROSSING
GRAHAM PROPERTY - VICINITY OF NW 107TH AVENUE AND NW 170TH STREET
CITY OF HIALEAH, FL
GEOSOL PROJECT No.: 211130

BORING NUMBER	SAMPLE NUMBER	USCS SYMBOL	Sample Depth (FEET)	Sieve Analysis (Percent Passing)									Atterberg Limits (%)			Organic Content (%)	Natural Moisture Content (%)
				1"	3/4"	3/8"	#4	#10	#40	#60	#100	#200	Liquid Limit	Plastic Limit	Plasticity Index		
BB-2	2	OL	2.0 - 4.0	-	-	-	-	-	-	-	-	-	-	-	-	14	96
HA-2	1	PT	0.0 - 2.5	-	-	-	-	-	-	-	-	-	-	-	-	80	11
HA-6	1	PT	0.0 - 3.1	-	-	-	-	-	-	-	-	-	-	-	-	86	49

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TABLE 3 - SUMMARY OF ENVIRONMENTAL CLASSIFICATION TEST RESULTS
CITY OF HIALEAH REVERSE OSMOSIS WATER TREATMENT PLANT
CITY OF HIALEAH, FLORIDA
GEOSOL PROJECT No.: 211130

SAMPLE LOCATION	SAMPLE TYPE	Depth (ft)	pH	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)	Redox Potential (mV)	FDOT ENVIRONMENTAL CLASSIFICATION	
								Steel	Concrete
W-10-1	WATER	3	8.8	2,150	45	171	225	MA	MA
W-2-2	WATER	1.3	7.5	1,390	56	53	290	MA	MA

NOTES: (1) THE FOLLOWING FDOT AND ASTM LABORATORY TEST METHODS WERE UTILIZED:

FM5-550: pH FM5-552: Chlorides ASTM 1498: Redox Potential

FM5-551: Resistivity FM5-553: Sulfates

(2) SA: SLIGHTLY AGGRESSIVE

(3) MA: MODERATELY AGGRESSIVE

(4) EA: EXTREMELY AGGRESSIVE

(5) Borings W-10-1 and W-2-2 were performed for wells Nos. 2 and 10 of this project. The results were submitted in our report dated June 8, 2011.

FDOT Criteria for Substructure Environmental Classification (FDOT *Structures Design Guidelines* 2011)

Classification	Environmental Condition	Units	Steel		Concrete	
			Water	Soil	Water	Soil
Extremely Aggressive (If any of these conditions exist)	pH		< 6.0		< 5.0	
	Cl	ppm	> 2000		> 2000	
	SO_4	ppm	N.A.		> 1500	> 2000
	Resistivity	Ohm-cm	< 1000		< 500	
Slightly Aggressive (If all of these conditions exist)	pH		> 7.0		> 6.0	
	Cl	ppm	< 500		< 500	
	SO_4	ppm	N.A.		< 150	< 1000
	Resistivity	Ohm-cm	> 5000		> 3000	
Moderately Aggressive	This classification must be used at all sites not meeting requirements for either slightly aggressive or extremely aggressive environments.					

pH = acidity ($-\log_{10}H^+$; potential of Hydrogen), Cl = chloride content, SO_4 = Sulfate content

MOISTURE CONTENT TEST RESULTS (ASTM D-2216)

PROJECT NAME: DESIGN OF RAW WATER TRANSMISSION MAIN, WELL MAINTENANCE PIPELINE AND WELL SITE DEVELOPMENT
LOCATION: CITY OF HIALEAH, FL
PROJECT No.: 211130
DATE: 4/20/2012

Boring No.	BB-2	HA-2	HA-6
Sample No.	2	1	1
Sample Depth (Feet)	2-4	0-2.5	0-3.1
Tare No.	3	88	6
Tare plus wet soil (grams)	103.5	346.0	314.5
Tare plus dry soil (grams)	57.5	313.5	214.0
Water W_w (grams)	46.0	32.5	100.5
Tare (grams)	9.5	9.5	9.0
Dry soil W_s (grams)	48.0	304.0	205.0
Water Content w (%)	95.8	10.7	49.0

ORGANIC CONTENT TEST RESULTS (ASTM D-2974)

PROJECT NAME: DESIGN OF RAW WATER TRANSMISSION MAIN, WELL MAINTENANCE PIPELINE AND WELL SITE DEVELOPMENT
LOCATION: CITY OF HIALEAH, FL
PROJECT No.: 211130
DATE: 7/20/2011

Boring No.	BB-2	HA-2	HA-6
Sample No.	2	1	1
Sample Depth (Feet)	2-4	0-2.5	0-3.1
Crucible No.	PSF	PBB	PBF
Weight of Crucible and Oven-Dried Sample (grams)	70.5	87.5	106.5
Weight of Crucible and Sample after Ignition (grams)	64.5	63.5	73.0
Weight of Crucible (grams)	28.0	57.5	67.5
Weight of Oven-Dried Soil (grams)	42.5	30.0	39.0
Weight Loss due to Ignition (grams)	6.0	24.0	33.5
Percent Organics (%)	14.1	80.0	85.9

XENCO Laboratories
Florida Testing Services, LLC

Certificate of Analytical Results 416455

Geosol Inc., Miami Lakes, FL

CITY OF HIALEAH RAW WATER MAIN

Sample Id: W-10-1	**Matrix:** Water	**Date Received:** May-12-11 17:40
Lab Sample Id: 416455-001	**Date Collected:** May-10-11 14:00	

Analytical Method: pH by SM4500-H
Tech: KLH
% Moisture:
Analyst: KLH
Seq Number: 855984

Parameter	Cas Number	Result	PQL	MDL	Units	Analysis Date	Flag	Dil
pH	12408-02-5	**8.77**	0.100	0.100	SU	05/13/11 15:20		1

Analytical Method: Inorganic Anions by EPA 300
Prep Method: E300P
Tech: DAH
% Moisture:
Analyst: DAH
Date Prep: May-19-11 15:44
Seq Number: 856907

Parameter	Cas Number	Result	PQL	MDL	Units	Analysis Date	Flag	Dil
Chloride	16887-00-6	**45.0**	0.500	0.0664	mg/L	05/19/11 15:44		1
Sulfate	14808-79-8	**171**	0.500	0.0755	mg/L	05/19/11 15:44		1

Analytical Method: Resistivity by ASTM D1125
Tech: KLH
% Moisture:
Analyst: KLH
Seq Number: 856749

Parameter	Cas Number	Result	PQL	MDL	Units	Analysis Date	Flag	Dil
Resistivity (as received)	RESISTIVITY	**2150**	10.0	10.0	Ohm-c	05/19/11 16:45		1

Project: Florida Standard List of Methods

XENCO Laboratories
Florida Testing Services, LLC

Certificate of Analytical Results 417248

Geosol Inc., Miami Lakes, FL

Hialeah Raw Water Tran Plant

Sample Id: W-2-2 **Matrix:** Water **Date Received:** May-19-11 16:45
Lab Sample Id: 417248-001 **Date Collected:** May-18-11 18:00

Analytical Method: pH by SM4500-H
Tech: 4137 **% Moisture:**
Analyst: KLH
Seq Number: 856963

Parameter	Cas Number	Result	PQL	MDL	Units	Analysis Date	Flag	Dil
pH	12408-02-5	7.45	0.100	0.100	SU	05/20/11 18:20	Q	1

Analytical Method: Inorganic Anions by EPA 300 **Prep Method:** E300P
Tech: DAH **% Moisture:**
Analyst: DAH **Date Prep:** May-26-11 23:26
Seq Number: 857817

Parameter	Cas Number	Result	PQL	MDL	Units	Analysis Date	Flag	Dil
Chloride	16887-00-6	55.9	0.500	0.0664	mg/L	05/26/11 23:26		1
Sulfate	14808-79-8	52.9	0.500	0.0755	mg/L	05/26/11 23:26		1

Analytical Method: Resistivity by ASTM D1125
Tech: DAD **% Moisture:**
Analyst: KLH
Seq Number: 857312

Parameter	Cas Number	Result	PQL	MDL	Units	Analysis Date	Flag	Dil
Resistivity (as received)	RESISTIVITY	1390	10.0	10.0	Ohm-c	05/24/11 17:30		1

Project: Florida Standard List of Methods

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Hialeah – ROWTP Pipelines, Access Road and Well Pads No.'s 8, 9, 12 & 13 And Electrical Conduits & Equipments

27	Silt Fence	LF.	7,970		
28	Grass	S.Y	7,288		
29	Landscaping - Simpson Stopper (3 gal.)	LF.	700		
30	Gravel Bed	C.Y.	1,839		
31	12" -45 degree Bend - DR9	EA.	16		
				Sub-Total	

ITEM NO.	ITEM DESCRIPTION	UNIT	EST. QTY.	UNIT COST	TOTAL COST
1	Square "D" Class 7230, 23 kv/277 – 480 volt, 225 kva pad mounted transformer	EA.	4		
2	S & C Vista 312, 25 kv pad mounted distribution switch	EA.	1		
3	5 inch PVC - Sch. 40 electrical conduit (No Encased)	LF.	8,500		
4	25 kv, 1/0 cable	LF.	28,000		
5	600 amp connectors	EA.	3		
6	200 amp connectors	EA.	30		
7	Transformer Foundation Pad	EA.	4		
8	Distribution Switch Foundation Pad	EA.	1		
9	Installation of FPL provided conduits and FPL equipment foundation pads	L.S.	1		
10	Trenching	LF.	4,135		
11	Switch and Transformer Pad Installation	L.S.	1		
12	Wire Installation	L.S.	1		
13	Switch and Transformer Installation	L.S.	1		
14	Wire Terminations	L.S.	1		
15	Equipment Rental Including Operator Cost	L.S.	1		
16	Electrical Project Manager	L.S.	1		
17	Electrical Supervisor	L.S.	1		
18	F & I Handhole	EA.	4		
				Sub-Total	

1	Access Road and Pads Unsuitable Material Excavation	C.Y.	11,706		
2	Access Road and Pads Subsoil Backfill	C.Y.	15,218		
3	Fill (Access Road and Pads from existing grade)	C.Y.	14,586		
				Sub-Total	

Grand Total	

1	10% Overhead and Profit	
2	2% Bond and Insurance	
3	Contingency Fund (10% of subtotal amount)	
4	Survey	
5	As Built	
	TOTAL PROJECT COST:	

* Geotechnical Testing and Report have not been performed (Assumed 2.5' of Unsuitable Material)